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NOVEMBER • 1960

GRINDING and FINISHING

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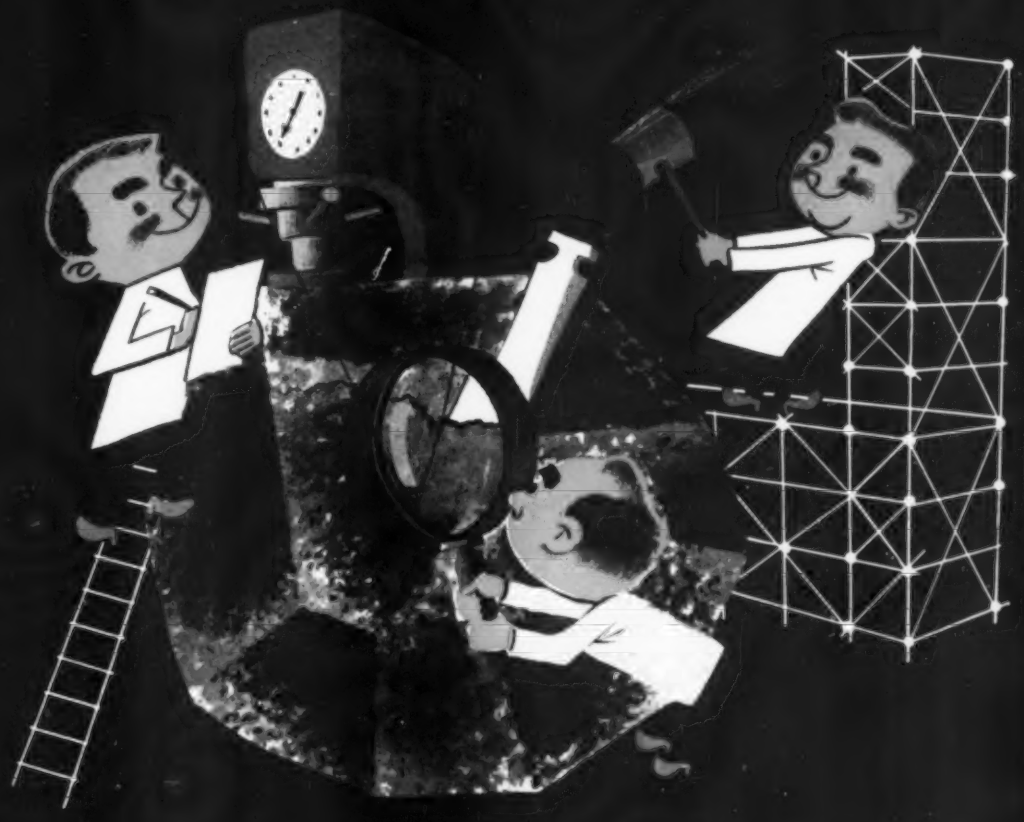
TECHNOLOGY
MENT

IN THIS ISSUE:

What Functions Do Grinding Fluids Perform?

How U.S. Steel Selects Wheels For Maximum Efficiency

Dressing Time Reduced to Eight Hundredths of a Minute



GRIT HARDNESS and TOUGHNESS

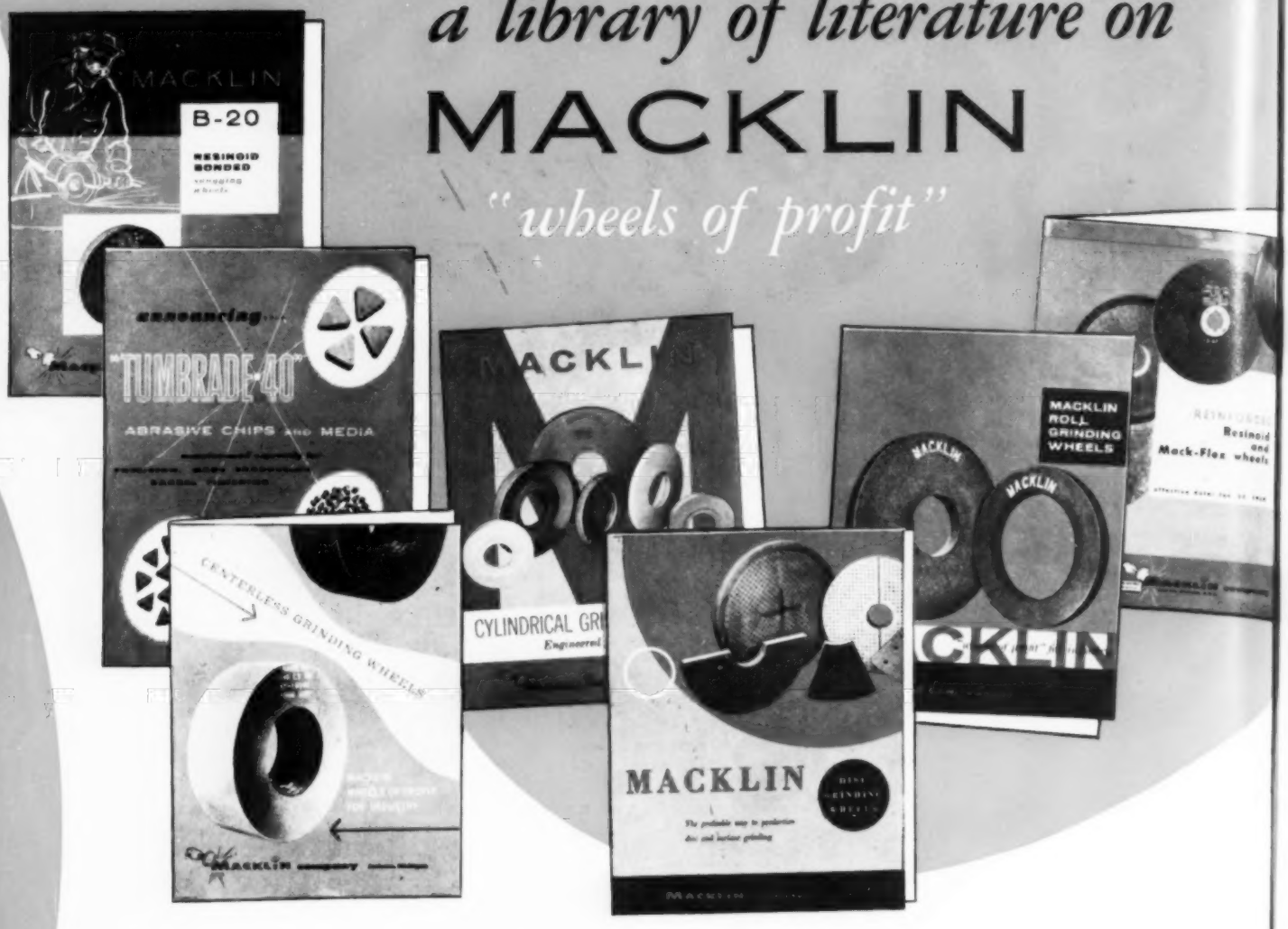
. . . HOW DOES IT AFFECT YOUR GRINDING OPERATIONS?

YOURS.....

a library of literature on

MACKLIN

"wheels of profit"



Looking for new economies in your production grinding? The answers you've been looking for may well be in this new Macklin literature. It contains specific wheel recommendations for various operations, and is documented with actual case histories showing cost-saving applications.

YOURS FOR THE ASKING . . . . . .

Literature on ( ) Snagging Wheels ( ) Tumbling Media
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GRINDING WHEELS

MACKLIN company

Dept. 63, Jackson, Michigan

WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

GRINDING and FINISHING

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Exclusive to GRINDING and FINISHING

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November Cover: A single abrasive grit—or grain or crystal, as you will—is the center of operations on this month's cover, introducing the first of a group of articles about some of the technical aspects and characteristics of manufactured abrasives. Future articles in this area, by some of the best research men of the industry, will be appearing from time to time in future issues. What is inside such a grain, and what happens when it slams into a workpiece, can definitely affect your grinding.

Subscription rates: $6.00 per year in U.S.A. $7.50 per year elsewhere.
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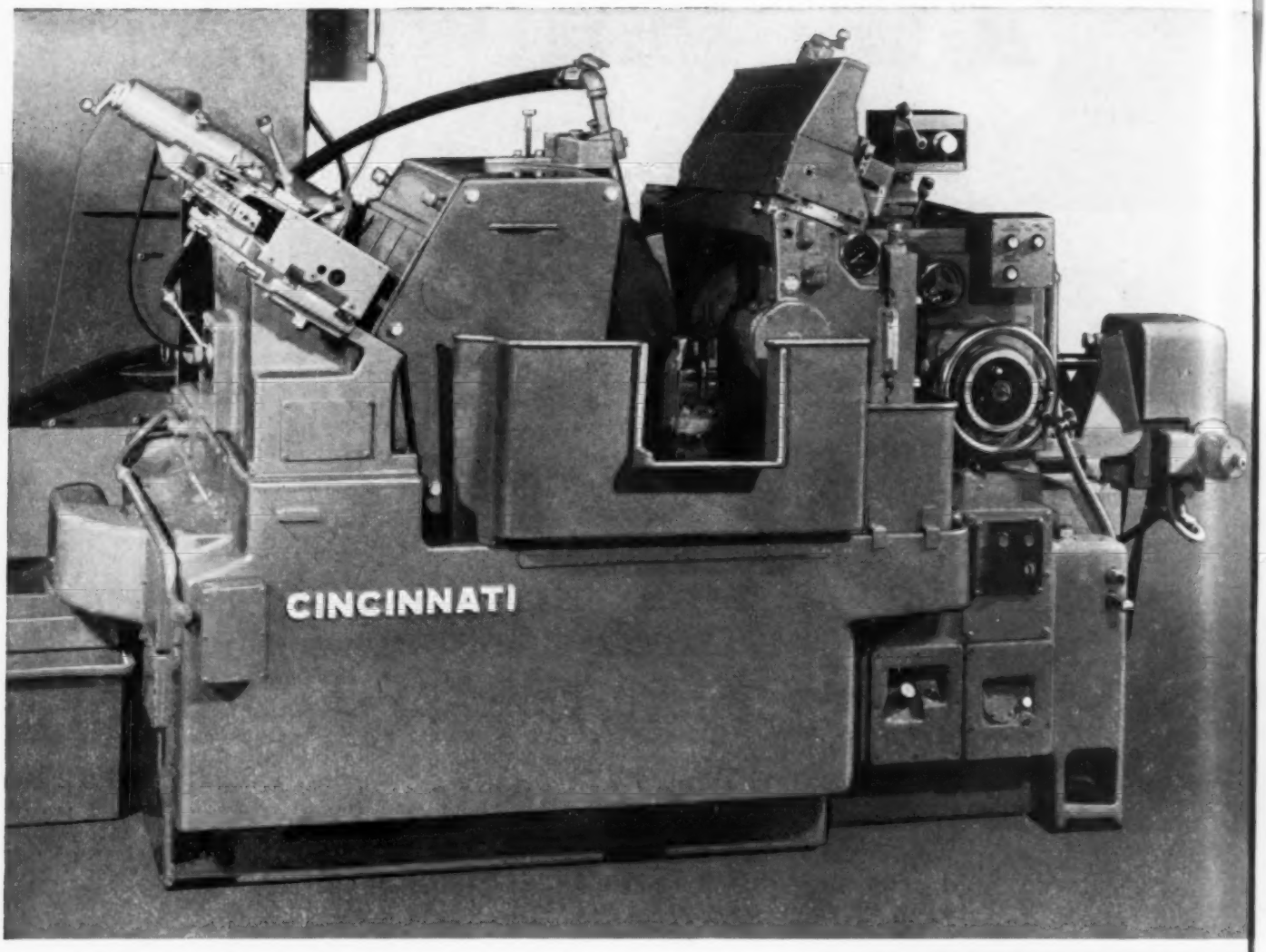
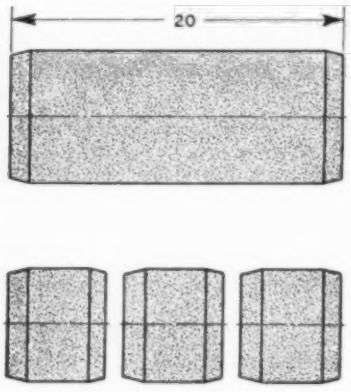


New CINCINNATI FILMATIC No. 340-20 Centuramic, with 20" wide wheel. Powered by a 40 hp spindle drive motor, this Centuramic removes .007" stock in two passes at the fast thrufeed rate of 15 ft. per min. Details in catalog G-727D.



One 20" wide wheel Centuramic exceeds the thrufeed production potential of three 6" wide wheel machines . . . because nearly 60% more abrasive per minute contacts the work!

Automatic guardian of size—Cincinnati's new trend type ACRASIZE Post-Process Gaging.

BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTER RO

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

Exposition revealed many benefits...

MMT-PE

One replaces three-

Cincinnati No. 340-20 Centuramic Centerless cuts 6 thrufeed passes to 2

New ideas . . . new machines . . . new ways to reduce costs were evident everywhere at the Machine Tool Exposition. In the bustling crowds, perhaps you did not have time to ponder the demonstration of this precision grinding truism in Cincinnati's extensive exhibit: *reducing the number of passes sharply reduces the cost of thrufeed centerless work.*

There are two ways to reach this desirable end result. 1) The risky way, by reducing grinding stock to the danger point of inviting scrap. 2) The safe and sure way, by wide wheel thrufeed grinding on a CINCINNATI No. 340-20 Centuramic Centerless. This fine new machine makes heavy grinding stock disappear quickly. That's because the wheels are 20″ wide, and wide wheels can remove more stock per pass than narrow wheels. Of course, the entire machine, from the bed casting to the FILMATIC spindle bearings, is constructed to take advantage of the heavy duty potential of extra wide wheels. And the FILMATIC spindle bearings perform equally well under the dual requirements for heavy stock removal and light-as-a-whisper finishing passes.

Cincinnati attachments and accessories reduce costs still further. One of the newest is ACRASIZE Post-Process Gaging. It automatically gages the parts as they leave the grinding throat, and adjusts for variations in size.

You will find complete information on heavy duty CINCINNATI Centuramic Centerless Grinders in catalog G-727D. Ask for a copy today.

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Editor's Mail

CORRECTION

I have a copy of page 49 from the August 1960 issue of your magazine.

On the aforementioned page there is a write-up titled "New Sine Angle Magnetic Chucks Speed Light Machine Set-Ups" which gives a very nice write-up of our new sine angle magnetic chuck. However, it has been noted that there was one error which concerns the accuracy to which the chuck is manufactured. In the 4th paragraph of your copy "They're alike, round and straight within a tolerance of .0005", and parallel with each other . . ." the error is in the .0005" figure. This should be .00005" in order that it would agree with the last dimension of .00010".

I am bringing this to your attention with the only thought of this being in some way a constructive thought and to provide you with the true dimensional characteristics of our sine angle magnetic chuck.

Very truly yours,
The Taft-Peirce Manufacturing Co.
K. G. Wheeler
Assistant Manager-Marketing Services
Woonsocket, R.I.

Most interested readers have probably made this adjustment. Our apologies to Taft-Peirce because a zero more or less in such a spot can be—and usually is—quite critical.

European Common Market . . . New Abrasive Tariffs

The European Economic Community (European Common Market) has published a schedule of proposed tariff rates applying to abrasive and machine tool imports from non-member companies. Subject to amendments resulting from GATT negotiations, the tariffs will become effective between January 1, 1970 and January 1, 1973, with the first of three adjustments in present tariffs starting January 1, 1961.

France and Italy, having generally higher rates, will lower their rates in three steps, beginning in 1961. Germany and the Benelux countries, will begin raising their rates in similar steps.

For most grinding wheels, the proposed tariff rate is 10%, while coated abrasives will carry a rate of 11%.

Grinding machines will have rates ranging from 14% (portable electric tools) down to 4% (non-precision grinders).

Precision grinders (adjustable within .01 mm) will be listed at 10%, cut-off and slotting machines at 6%, and ultrasonic machines at 8%.

Hertz Foundation Promotes Engineering Scholarships

In three years of operation, the Hertz Engineering Scholarship Foundation has found substantial numbers of qualified high school graduates for whom financial aid could not be made available either from present Foundation resources or from the resources of similar agencies.

This has meant that a substantial number of qualified young men and women whose engineering talents are critically needed will not be able to undertake or continue their studies.

The directors have therefore made the administrative facilities of the Foundation available without charge to persons, corporations or other organizations wishing to provide scholarships in their names. The program has been designated the Plan of Sponsored Scholarships.

The basic requirements are that approximately $1,000 per year be pledged for each scholarship and that the intended college, if one is designated, be accredited by the Engineers' Council for Professional Development. Otherwise, sponsors have virtually complete freedom in their requirements.

All funds furnished by sponsors are set aside for financial aid, with the Hertz Foundation assuming all expenses for screening, pre-selection of finalists, computing financial needs, and other administrative costs.

The Hertz Foundation was established in 1957 by Fannie K. and John D. Hertz. The address is 1314 Westwood Boulevard, Los Angeles 24, California.

Cites Five-Year Strides in Precision Grinding, Boring

During the past five years the science of precision grinding and boring has made tremendous strides, according to A. Francis Townsend, vice president, engineering and development, The Heald Machine Company.

Major innovations noted by Mr. Townsend are: the combination of machining operations via transfer lines; application of numerical control; high production wheelheads capable of operating at speeds up to 150,000 rpm; development of systems-engineered internal grinders for bores as small as 0.040"; continued advances in automatic loading, gaging and chucking to reduce operator attention and cycle time; and machine design concepts which afford increased rigidity, power, accuracy and productivity. • • •

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One animal makes tracks like these, a pattern that is positively duplicated only by the grizzly bear. And only Cincinnati offers you the Positive Duplication of these SWING FRAME WHEELS, and of *all* CINCINNATI (PD) °SNAGGING WHEELS.

HOW WE ACHIEVE "PD"

To produce wheels of unsurpassed uniformity, Cincinnati developed a unique manufacturing process. It involves 36 separate quality controls, from formula blend to final inspection. For example, cams for temperature control of drying ovens must pass regular tests for accuracy, and checking procedures never vary.

HOW UNIFORMITY HELPS YOU

One big advantage of CINCINNATI (PD) WHEELS is—longer wheel life. Using (PD) WHEELS you get costs down and *keep* them down, because each reorder wheel will act and grind exactly like the original. This is the promise—and *performance*—of Positive Duplication.

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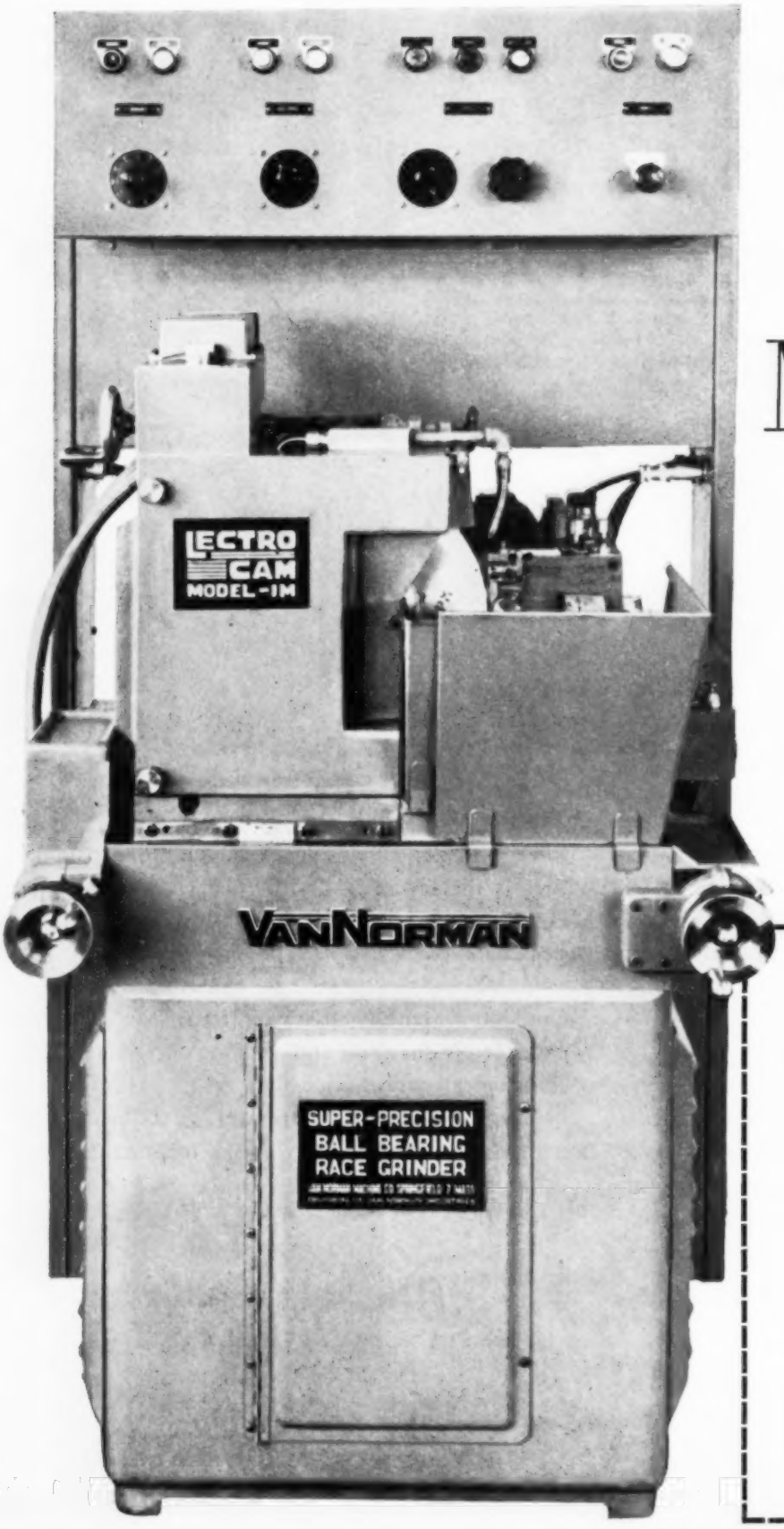
It wowed 'em in Chicago— and it's an eye-opener for all industry!

NEW MACHINE VAN



One of the biggest draws at the MACHINE TOOL BUILDERS' EXPOSITION

All-New VAN NORMAN MINIATURE BEARING GRINDER

...plunge-cut radius grinder specifically designed to meet the requirements of the bearing industry for fast, easy, precision grinding of ball grooves on inner races of miniature bearings.

SPOTLIGHTS NORMAN POLICY OF "INDUSTRY-INTEGRATED DESIGN"

Production Benefits Most-Wanted by Each Industry Supplied by Machines Engineered to the Industry's Specific Requirements.

Van Norman "Industry-Integrated Design"— as typified by the new Model-1M Lectro-Cam Miniature Bearing Grinder—offers every industry the machines it needs for higher production, finer precision and greater savings. This broad Van Norman program is based on your own specific requirements, engineered with Van Norman know-how and skill into production tools that do the best job for *you*.

Widely versatile Van Norman engineers will work with you, and with your men at the management, engineering and production levels. You'll find that Van Norman Machine specialists speak your language. Their preferred approach to any particular machining problem is one of close cooperation with the responsible people at every stage of the design and development of a new machine tool. Your own ideas and suggestions are carefully studied, and ways are sought to incorporate them as solid benefits through sound Van Norman design principles accumulated during more than six decades.

Whatever your machine requirements, you will get all-round efficiency through Van Norman "Industry-Integrated Design." Let us know your needs. Contact Van Norman Factory or Van Norman Local Machine Tool Distributor.

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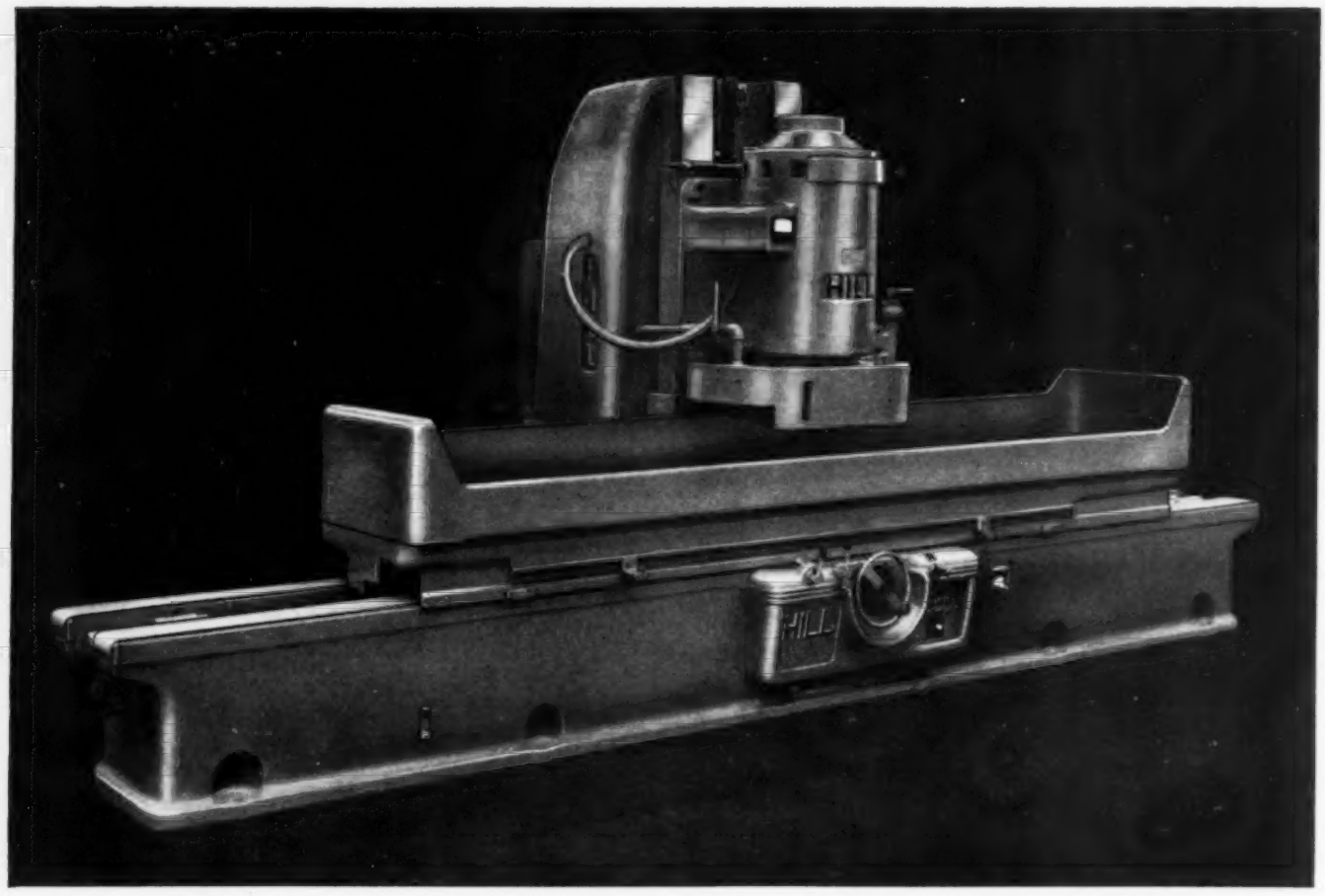
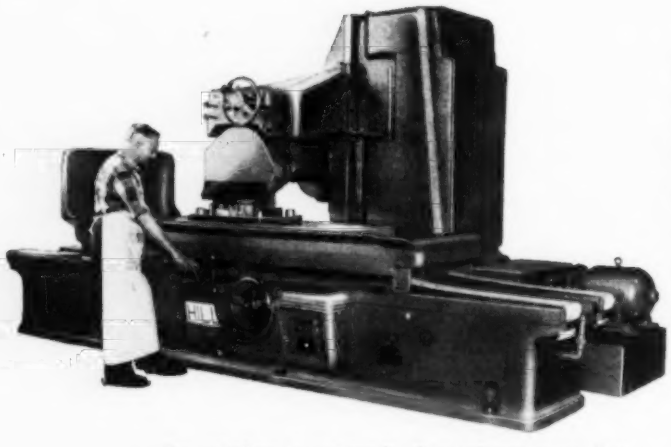


Hill Grinder ELIMINATES MILLING OPERATION



For grinding to extremely close tolerances on flats, angles, irregular and special shaped surfaces the HILL Horizontal Spindle grinder is recommended.

Expensive, time consuming milling operations can be eliminated in finishing die blocks, bolster plates etc. with the new HILL Vertical Spindle Hydraulic Surface Grinder. Equipped with either 75 or 100 HP main spindle motor, the segmented grinding wheel provides fast stock removal and produces an accurate finish in approximately half the time required for a combined milling and grinding operation.

The HILL fully hydraulic reciprocating table is adaptable to a wide variety of stock sizes having flat surfaces. Table widths are 18″, 24″ and 30″ with table lengths from 5 to 20 feet.

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We now manufacture, distribute & service the entire line of KLING metal working tools.

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NOVEMBER, 1960

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Socialism and You

The easiest thing in the world to accept is something which appears to be free. But, if we are to stay free men, we must express our opinions on each give-away program after we have taken a long, hard look at what it is going to cost us. The farm program, subsidies, federal aid to education and many others appear to be very humane and worth-while programs, but each costs us more than we can ever benefit. Each brings us closer to socialism and takes away more of our constitutional freedoms.

For our "let Charlie do it" thinkers, it would be best if the politicians were strong enough in character to say they would save us from ourselves, but unfortunately leaders of this school of thought have not been re-elected, and those who are not strong enough have taken advantage of our weakness. (This is true of both parties.) This is the real dilemma which throws the ball right back in our laps. In order to stem the creeping socialism with which we are presently faced, we must express our desire to be cured of the disease.

This whole situation can be likened to a cold in which the first stages are only irritating and largely left unattended. Later, as the symptoms become more annoying, we start to practice good preventive measures. At this point, preventive action is of little help because we already have the cold. Let's not try prevention of socialism now; it is already here. It is now time for a cure.

After you have placed your ballot in the box, your job has just begun. Regardless of the party in power, it is up to you to see that it does not sell you into the serfdom of socialism. The malady of socialism has already started and the symptoms are easy to recognize.

The infection starts with our wanting something for "nothing." The politician takes it from there and while "giving" us something, extracts not only tax dollars at an ever increasing rate far above the actual cost but, even more important, removes a few more of our constitutional freedoms. We can stop this disease by first of all guarding against our own selfishness.

This country became a great world power because it was and is *of* the people, *by* the people and *for* the people. We will lose all if we become of the government, by the government and for the government.

M. M. Patterson

Managing Editor

HERE'S THE LATEST WORD ON COOLER GRINDING—

New COOLTEX by Texaco!

New Cooltex keeps machines cleaner, lets dirt and grit settle out faster. This means *freer, cooler grinding—without heat checks*—for smoother finishes. With Cooltex, wheels last longer, and you can even use a finer grit! Your Texaco Lube Engineer is sending out Cooltex reminder postcards. Watch for yours. Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

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Thompson's exclusive "CYBERMATIC PENDANT CONTROL" completely eliminates the elevating hand wheel

All vertical movement of the wheel head, both automatic and manual, on this modern Thompson 36 x 48 x 72 Type CX Plunge-Matic Grinder is accomplished effortlessly by dials on the Cybermatic Pendant Control.

This new pendant control performs the following functions: **Sets automatic down feed from .0002" to .006" in .0002" increments—sets the total amount of automatic down feed for stock removal from 0 to 1 inch through the entire 48" vertical capacity—controls automatic down feed increment (as pre-selected) at each reversal of the wheel head on cross feed or at each table reversal on straight plunge feed — controls a 20" per minute rapid traverse to the elevation of the wheel head—provides a push button to re-set the down feed range at operator's will — pre-sets a wheel dressing increment for automatic wheel trueing—compensates manually or automatically for wheel dressing —provides a master stop button for all movement.**

This Thompson machine is completely modern in every respect. Its features include the exclusive Thompson Hydra-Cool Hydraulic System with dual packless cylinders providing automatic cushioning. A separate automatic lubrication system for all sliding way bearings and tape bed way covers are standard equipment.

This modern Thompson grinder is both high powered and extremely accurate.

Further specifications will be furnished upon request.

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Thompson has taken another important step toward the ultimate in accuracy and precision by obtaining the exclusive use of the world famous MALCUS BLOCK BEARINGS for their wheel head spindles. The notable advantages of these bearings are listed above.

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THE THOMPSON GRINDER COMPANY • SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

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WILL REMOVE MORE METAL, FASTER—AT LOWER COST!

- ROUGHING WHEELS
- FINISHING WHEELS
- CUT-OFF WHEELS
- DIAMOND WHEELS
- SAFETY BACK FLARED CUPS
- *NEW* FAST CUT MOLDISCS
- *NEW* LONG-LIFE MOLDISCS
- *NEW* SNAGGING WHEELS FOR AUTOMATIC BILLET GRINDING

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Foundry Snagging—Billet Surfacing
Centerless Grinding
General Purpose Grinding with Portables
Grinding and Finishing Stainless Steel Welds
Bearing Race Grinding and Finishing
Finishing Tools and Cutlery

Cutting-off—Wet or Dry—Bars, Tubing, Structurals, etc.
Foundry Cutting—Standard and Reinforced Wheels
Grinding Carbide Tipped Tools

ABRASIVE, GRAIN SIZE, HARDNESS, STRUCTURE, BOND—EVERY WHEEL COMPONENT IS SELECTED FOR YOUR CUTTING AND GRINDING REQUIREMENTS. SEE YOUR MANHATTAN ABRASIVE WHEEL SPECIALIST.

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"MORE USE PER DOLLAR"

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There are two principal types of Behr-Manning resin-bonded abrasive belts:

RESINALL® . . . an all resin-bonded aggressive belt of strong X-weight cloth, for maximum heat resistance in most all rough and intermediate grinding operations.

RESINIZED® . . . a resin-over-glue belt of good heat resistance, in strong X-weight for flat polishing, and in flexible J-weight for contour polishing.

Prove to your own satisfaction how resin-bonded belts will save you time and money. Ask for an in-plant demonstration. Write Dept. GF-11, BEHR-MANNING Co., Troy, N. Y., a division of Norton Company.

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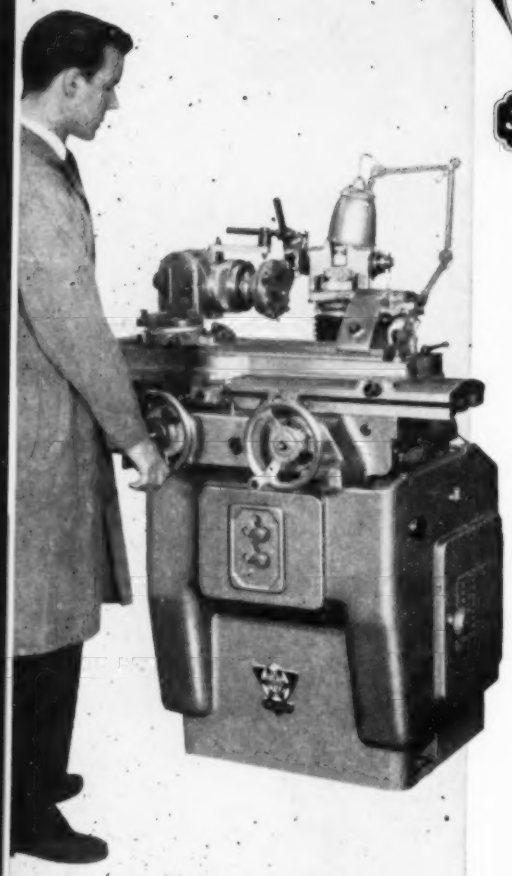
MANUFACTURED BY JONES-SHIPMAN LEICESTER, ENGLAND

TOOLROOM GRINDERS

MANY UNUSUAL FEATURES ASSURE HIGH EFFICIENCY



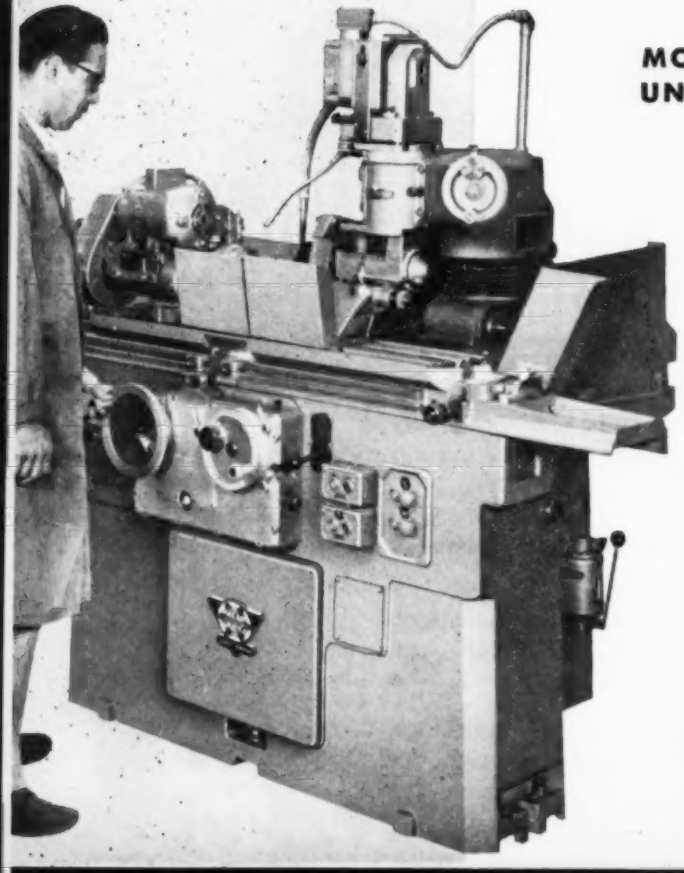
MODEL 310
CUTTER AND TOOL GRINDER

This grinder efficiently performs a wide range of grinding operations. Thus, tools and cutters can be ground in shortest possible time to keep production costs at a minimum.

FEATURES:

Universal operating positions—all within comfortable reach of operator • Anti-friction cross saddle mounting assures sensitive control to cross feed • Table traverses on precision roller chains, giving "fingertip" control • Table dogs reversible—one end spring loaded and the other a dead stop • Table swivels a full 90 degrees in left-hand direction and 45 degrees right-hand • Large diameter wheel spindle, mounted on specially selected preloaded bearings • Universal Cutter Head adjustable to swing from 8" to 12" diameters • Cutter Head and Tailstock provided with clearance angle setting adjustments.

For additional information, write for Micromatic Bulletin 139W.



MODEL 1014
UNIVERSAL TOOLROOM GRINDER

This 1014 Universal Tool Room Grinder is designed to give extraordinary sensitive control that results in *high quality external and internal grinding.*

Wheelhead has deep throat capacity and wheel position is centralized in relation to table. This permits surface grinding and offers special facilities for broach grinding.

The extra Universal Cutterhead extends the versatility of this highly accurate machine to cover tool and cutter grinding.

FEATURES:

Hand cross feed and vertical feed in .0001" increments • Auto cross feed per reversal of table of .0001" to .007" over .025" (reduction in work diameter of .050") • Automatic table traverse, 4 speeds provided. Micrometer adjustment to table traverse in .001" divisions • Wheelhead saddle on anti-friction mountings • Precision built wheelhead motor on anti-vibration mountings • Wheel spindle unit swivels full 360° • Five external grinding wheel speeds • Grinding wheels fitted on either end of wheel spindle. Nitralloy spindle runs in plain bearings • Vernier scales to wheelhead and table swivels • Fast cross traverse to wheelhead for setting purposes.

For additional information, send for Micromatic Bulletin 206Q.

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PRECISION PRODUCTION THROUGH MICROFINISHING — MICRO MATIC

Abrasive Engineer's Corner

ARTHUR RAKESTRAW • Contributing Editor

Grinding Tiny Holes

What suggestions have you for grinding holes smaller than .156" with a length about eight times the diameter? —H. F. G., St. Catherines, Ontario.

While considerable progress has been made in the manufacture of precision mounted wheels for use on high frequency spindles for the internal grinding of very small bores, the depth of bore indicated in your inquiry practically eliminates this type of product for your application.

Very small bores in miniature ball bearing races are successfully ground with precision mounted points. The operation is possible because the very small bore depth permits the use of a mounted wheel with an extremely small overhang, i. e., extension of the wheel outside of the spindle chuck housing.

You have suggested that the bores you are interested in grinding are eight times the bore diameter. Such a deep bore would require a spindle extension too long for the wheel to be operated at a satisfactory speed.

Should it be possible to redesign these particular parts to reduce the bore depth, thereby reducing the amount of wheel spindle extension, it is possible that mounted wheels could be used for these bores.

I understand that bores approximating the larger sizes you mention are now being honed. Just how small a bore such honing machines can accommodate I cannot say, but any one of the major honing equipment manufacturers would know. I'd suggest that you get in touch with one or more of them.

The only other possibility of correcting such small bores is the use of steel mandrels of the proper size with a lapping compound suited to the material.

(The first article of the recent series on honing ("Why Honing?" GRINDING and FINISHING, February, 1960, pp. 28, 29) indicates that honing has been successful on bores as small as .058" and where the bore length is four or five, or more, times greater than the diameter.)

THE CORNER is a good place for your problems, comments, and experience in abrasives and their uses. Send your questions or contributions to: A. S. Rakestraw, GRINDING and FINISHING, Wheaton, Ill.

Steel Regulating Wheels

I understand that in some plants steel regulating wheels are used on centerless grinding wheels grinding steel parts.

I have tried this a number of times but not with complete success. The work piece picks up the speed of the grinding wheels and spins out of the machine.

Could you possibly find out what metal these wheels are made of, and whether diamond or carbide tools are used to true up the wheel?—S. S., Lansdale, Pennsylvania.

The use of metal regulating wheels for centerless grinding is a very specilalized application, not too commonly found in industry.

How it originated is not definitely known. It might have made its debut during the war years, when the scarcity of natural rubber made necessary the substitution of vitrified and resinoid wheels. Synthetic rubber was not then available.

"That's Harry. He's a gear grinder."

After considerable investigation I have learned of a bearing manufacturer who is presently using metal regulating wheels on a No. 3 Cincinnati centerless grinder for the production of tapered steel roller bearings. The 14" diameter regulating wheel is 9" in width, 3" wider than the grinding wheel in use. It is designed with a spiral groove around its periphery no doubt to improve its frictional qualities.

A different regulating wheel is used for each size of steel roller to be ground. As I understand, no attempt is made to dress or true the metal regulating wheel in the grinder. As a wheel becomes worn, it is reconditioned in the tool grinding room.

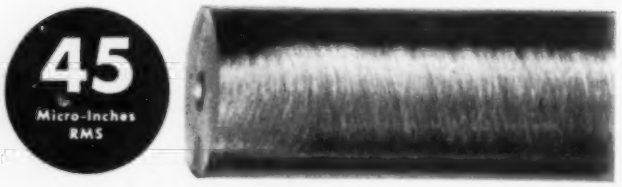
The successful use of metal regulatlating wheels on this particular application may result from the uniformity of the hardened steel rolls, which require a minimum of taper correction and stock removal.

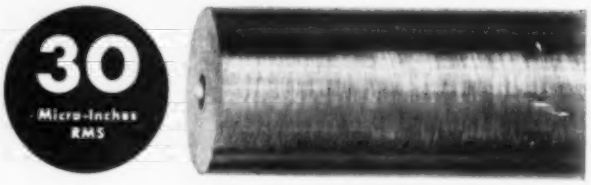
Undoubtedly there must be a large quantity of steel rollers of each dimension to justify the change of regulating wheels.

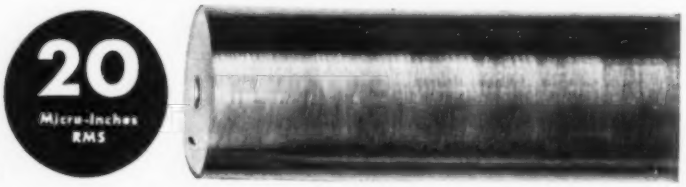
For miscellaneous centerless grinding, I feel that the standard rubber bonded regulating wheels, which can easily be dressed to improve wheel surface conditions or to conform to any change in angle, offer the best possible medium. The additional friction of the rubber bonded abrasive regulating wheel is added insurance against "spinning."

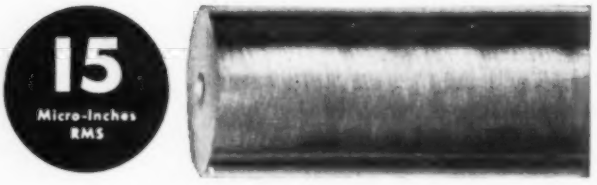
As you are aware, spinning will likely result unless the friction of the work against the rest and the regulating or holding friction of the regulating wheel equals or is greater than the friction of the abrasive grinding wheel.

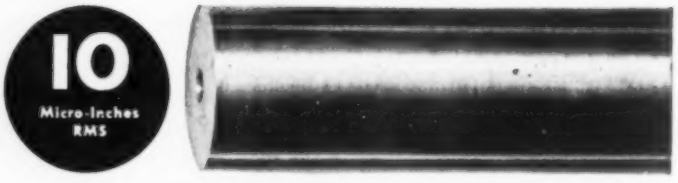
Though I did not learn the exact material used in the metal regulating wheel, it could be assumed that some form of cast iron would have definite advantages in offering the best possble frictional values. • • •

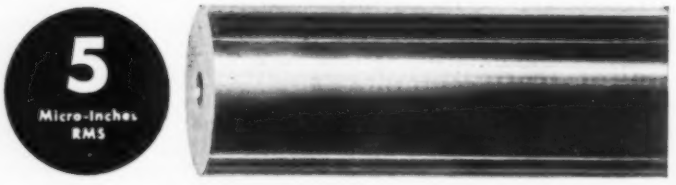












Here's the quick, low-cost way to get any Controlled Surface Finish

Are you paying more than necessary to obtain *controlled surface finishes?* You probably are if Gisholt Superfinishing is new to you. You are losing time, money and paying a premium for quality as well, on many jobs.

With Superfinish you preselect the surface finish you need—as high as 80 or as low as 1 micro-inch RMS—and you get it faster, at less cost than by any other method. Rather than an expensive extra step, Gisholt Superfinishing actually eliminates tedious, more costly processes.

Not only do you save time and money, but you get a "controlled" surface finish, free of smear metal—with the true base metal exposed—one that provides greater area contact for heavier loads and longer life in your specific application.

Whether your job requires a 1, 20 or 80 micro-inch finish, setup is fast and easy. Nothing is left to the operator's skill or judgment. Stone pressure and grade, and reciprocation rate are preselected to produce the finish you require, for job lots or large production runs.

It will pay you to find out how Gisholt Superfinish can cut costs, improve quality and lengthen service life on your standard or problem parts. Ask your Gisholt Representative or write for Bulletin 1169.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • *Factory-Rebuilt Machines with New-Machine Guarantee*

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Progress Report on

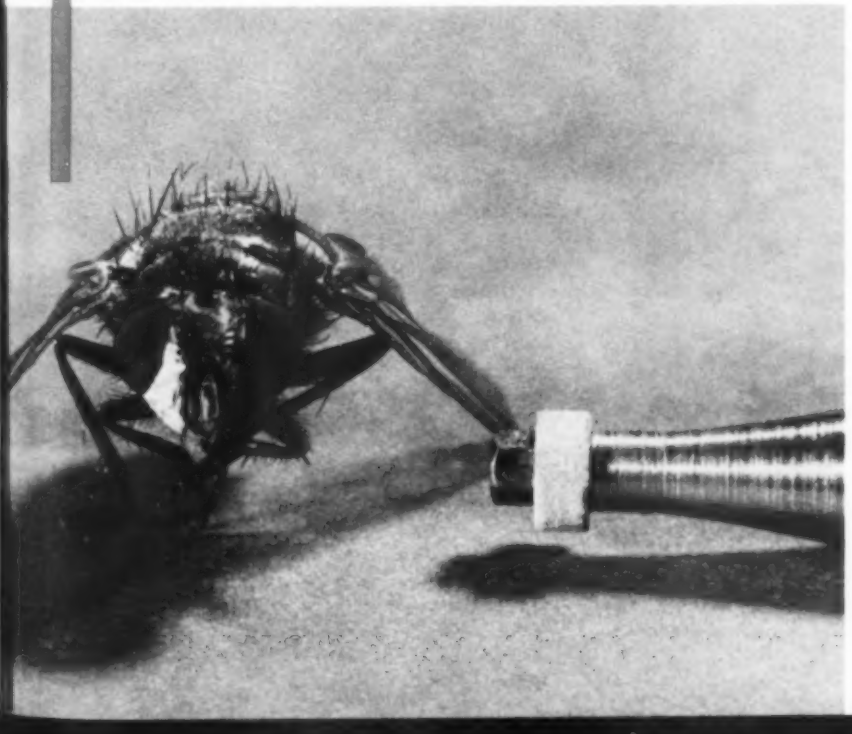
BAY STATE

BAY STATE ®

WHEELS of PROGRESS

Bay State Reports:

AN IMPORTANT ADVANCE IN MICRO-MINIATURIZATION

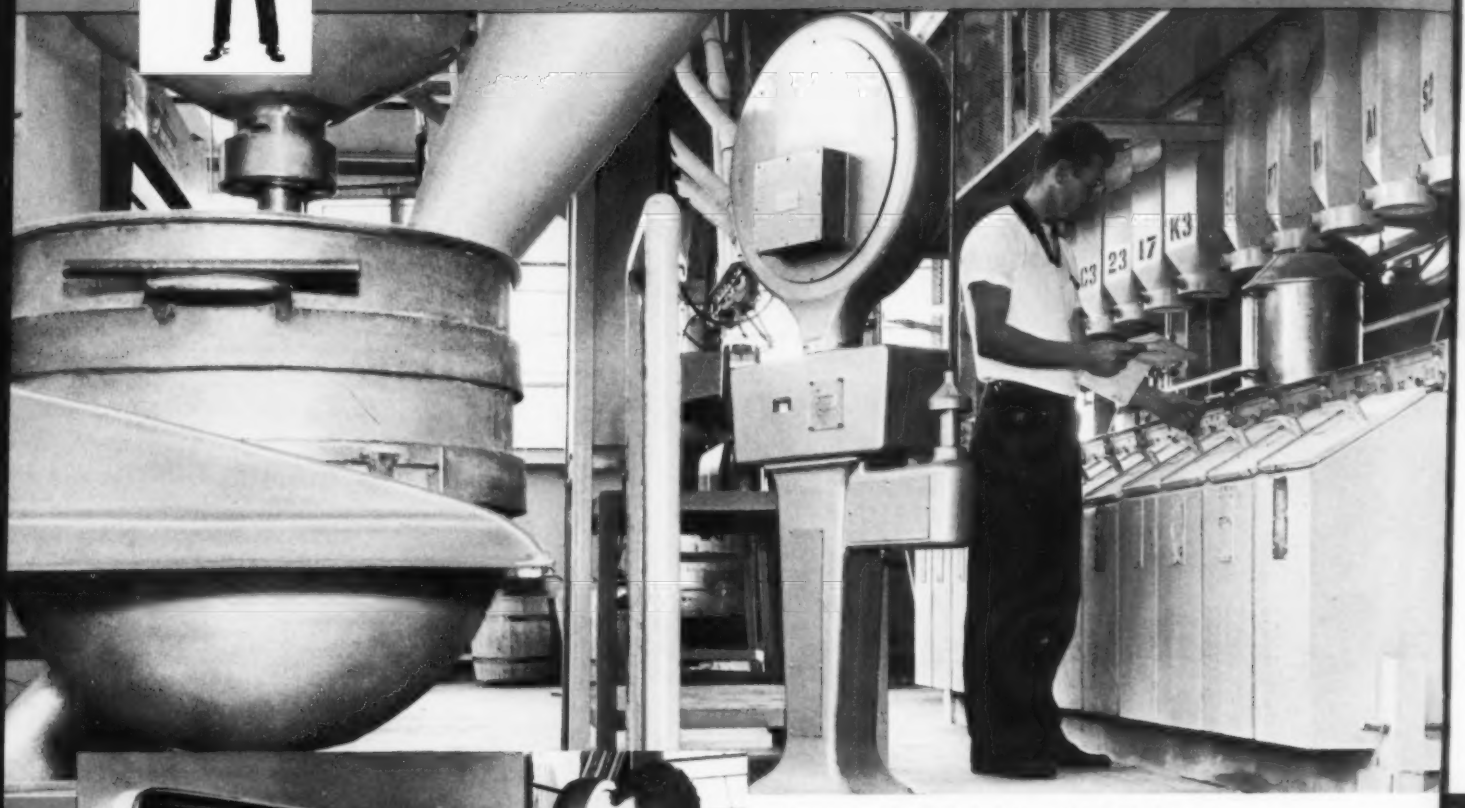


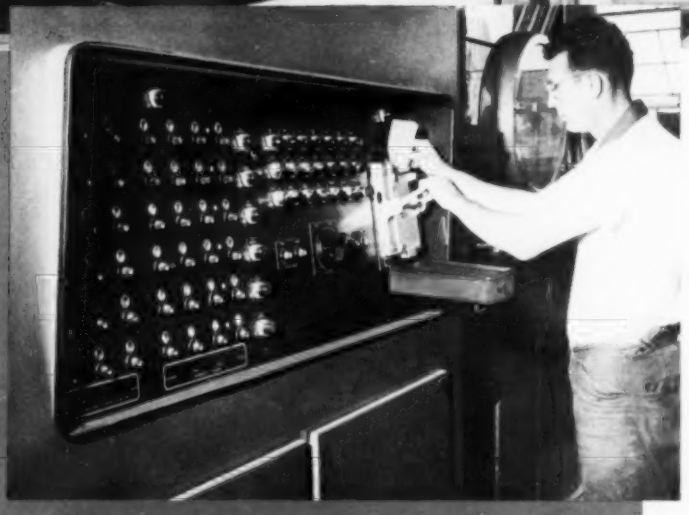
Tiny Grinding Wheels Developed for Delicate Tasks

Key feature in the development of this micro-miniature grinding wheel is its interchangeability. Previous ultra-small wheels had to be bonded permanently to a tool shaft. Bay State developed entirely new manufacturing techniques and produced true wheels which could withstand the strains set up when such a wheel is clamped to its shaft with a retaining nut. Special abrasive grit combinations were also developed to give superior finishes. In addition to substantially lower wheel costs, users have saved a considerable amount of set-up time during wheel changes in such operations as turning out micro-miniature ball-bearing races for high-speed cameras, tape recorders, missile guidance systems, etc.

On many larger diameter bores and races, Bay State's precision-mounted wheels, made in the conventional manner, continue in high demand due to their excellent performance.

Bay State Reports: OPTIMUM CONSISTENCY IN ABRASIVE PRODUCTS THROUGH INCREASED AUTOMATION



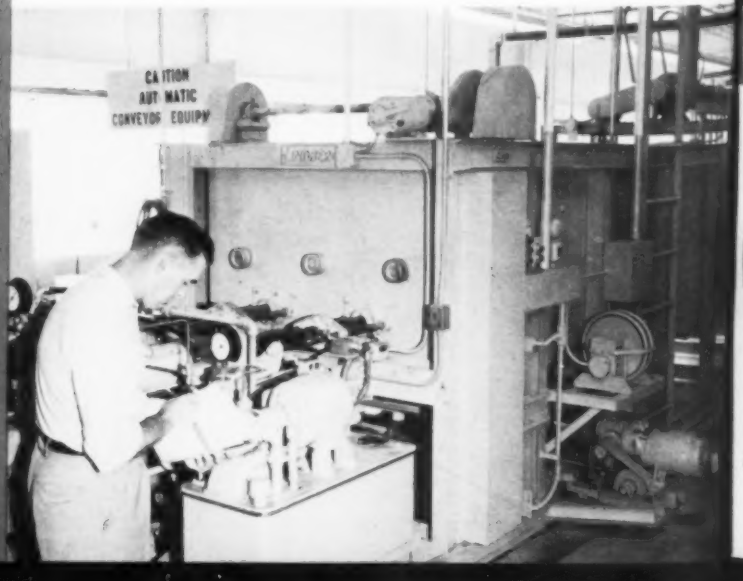


Automatic Weighing & Mixing

Weighing abrasive and bonding materials is a tricky business when it's done by hand. Yet consistent performance *depends* on accurate proportioning of all ingredients. That's why Bay State's ultra-modern automatic weighing and mixing equipment is such an important step forward in abrasive technology. Here, operator Richard Donovan (left) inserts a punched card in the control console which will make a completely automatic series of abrasive-grain weighing operations. Above, Donovan checks a bond-weighing cycle after setting it up on the console behind him. In the foreground is a high-speed mixer fed by chute from the automatic weighing equipment on the floor above. The accuracy and speed of this equipment enables Bay State to keep costs down and provide amazingly precise duplication of wheel specifications.

180 Feet of Controlled Super-Heat ▶

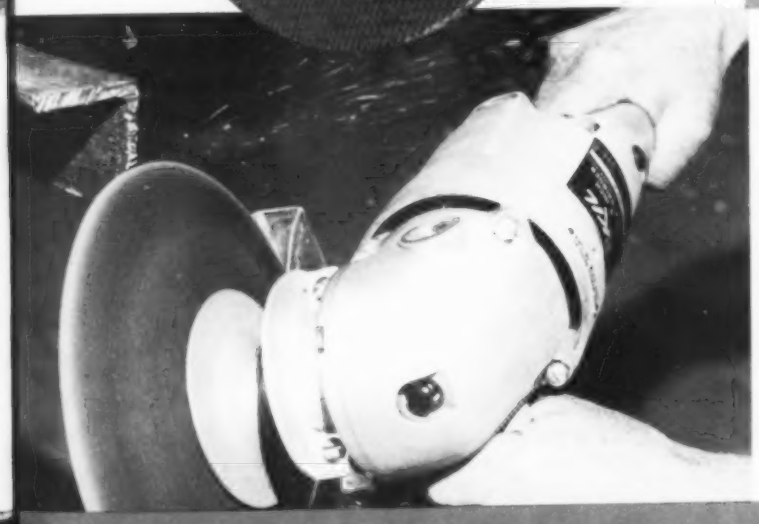
This is the ultimate in autofnatic kilns. Even the chemical composition of the atmosphere inside it is controlled by an exothermic gas generator which maintains exactly the atmosphere that best suits the formula of the honing stones and other abrasive products being fired. Electric heating elements provide constant, even heat (maximum is about 2350°F) without contaminating the atmosphere with unwanted by-products of combustion. Electronic controls are housed in a special air-conditioned room. Automatic feeding machinery delivers the abrasive products to powerful, hydraulic rams which give a 7000 lb. push and keep the production line moving through the kiln at a constant speed. Associate Laboratory Engineer Bill McMahon is shown here checking gauge readings.



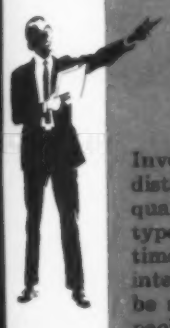
Bay State Reports:

IMPROVED PERFORMANCE IN WELD-GRINDING THROUGH IMPROVED DESIGN

Bay State's new "Koolie Hat" portable grinding wheel cuts easier, safer and faster than any comparable wheel on the market. Its shape enables it to be held at a shalow (4° to 5°) angle so that operators work in a relaxed posture . . . are less prone to accidents caused by fatigue. The shape also ensures uniform wear on the periphery of the wheel so that thickness remains constant and only the wheel's diameter decreases . . . and the danger of shattering is virtually eliminated. Narrow radial contact area also ensures more uniformly high cutting speeds and prevents cracking due to heat build-up.



BAY STATE
WHEELS of PROGRESS



Bay State Reports: **BETTER SERVICE TO CUSTOMERS THROUGH PRE-PACKAGING**

Inventory control is greatly simplified for users and distributors, both, by pre-packaging of wheels in quantities that make logical units of supply for given types of grinding operations. Counting and handling time are reduced and such products as tool room, internal grinding, reinforced and mounted wheels can be supplied in their own protective packages. New packaging materials provide better protection than ever against dirt and breakage.

Bay State Reports:

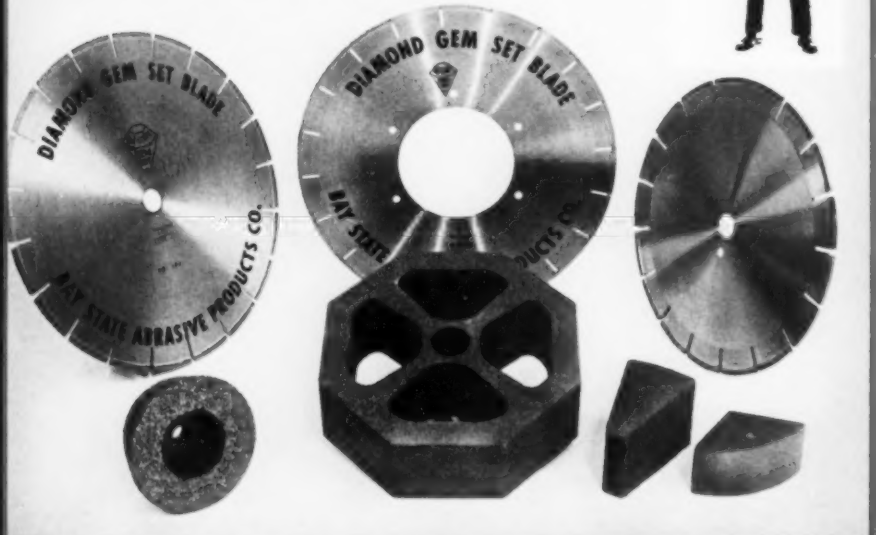
ULTRA-THIN DICING AND WAFERING WHEELS FOR THE ELECTRONICS TRADE

These wheels are the real glamour queens of the abrasive industry. Their metal-bonded, diamond abrasive grit cuts through hard crystals of Quartz, Germanium and Silicon like a knife through well-aged cheddar. The wheels themselves are literally paper-thin (as thin as .006" to be exact!) so that they slice these valuable, electronic, semi-conductor materials with an absolute minimum of waste. Yet, these micro-thin blades are so rigid they cut with the utmost precision. Extra-deep diamond sections ensure maximum smoothness of finish and extra economy in terms of prolonged blade life. Bay State is now ideally situated to supply all of the great electronics manufacturing areas in the U. S.

Bay State Reports:

HIGH PERFORMANCE ABRASIVE PRODUCTS FOR THE STONE TRADE

There's nothing miniature about Bay State's diamond wheels for the stone trade. They're big, rugged brutes that slice through granite, marble, flagstone, quartzite and slate almost as easily as they do through sandstone, soapstone and the other softer minerals. Bay State also furnishes wheels and special shaped abrasive stones to fit all standard machines used for smoothing and finishing granite, marble and other types of stone. In each case Bay State develops the products for maximum cutting speed, precision and durability, resulting in the lowest cost per foot of cutting. Incidentally, with its greatly expanded diamond wheel facilities, Bay State is now one of the largest producers of diamond wheels in the abrasives industry.



BAY STATE
WHEELS of PROGRESS

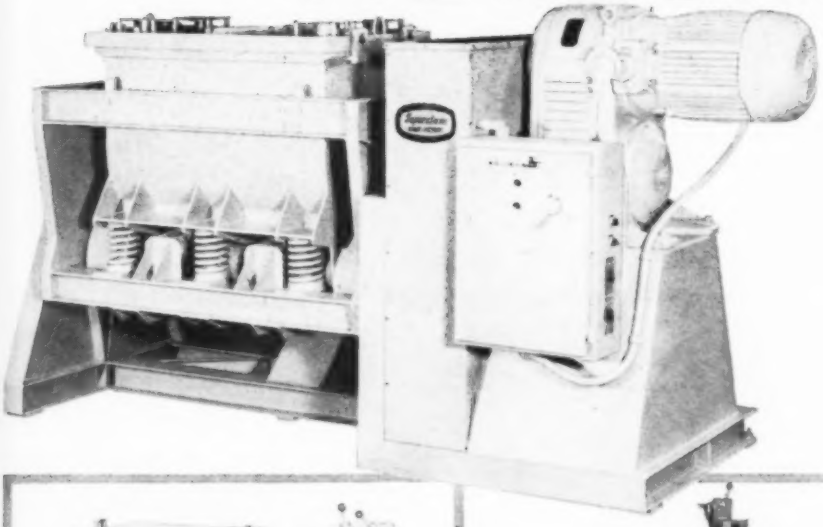
BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

UP TO 100 TIMES FASTER FINISHING WITH

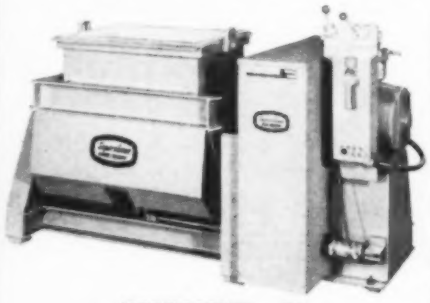
ALMCO

VIBRASHEEN



ALMCO'S FULL LINE OF NEW VIBRASHEEN MACHINES

MODELS VT-717 — 712
(18 and 12 cu. ft. capacities)
Ideal for large components requiring fixtures or a large volume of smaller parts.

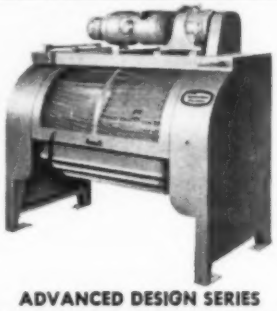


MODELS VT-77 — 75
(7 and 5 cu. ft. capacities)
Efficiently deburrs and finishes parts in quantities suitable for medium size production runs.

MODELS VT-72 — 71
(2½ and 1 cu. ft. capacities)
Popular unit for firms requiring precise finishing of a wide variety of parts in small lots.

MODEL VT-70
(¾ cu. ft. capacity)
Bench model ideally suited for miniature bearings, extremely small gears, stampings, etc.

WORLD'S LARGEST LINE OF PRECISION FINISHING EQUIPMENT



ADVANCED DESIGN SERIES
Thirteen models are available in this series featuring capacities of from 5 to 40 cu. ft., each equipped with variable speed drives. (Infinite from 6 to 30 rpm's.)

SPINDLE MACHINES
Designed for fast precision finishing of complex, high quality components such as gears, bearing cages, spline shafts, rotors, on continuous production "in line" basis.

CUSTOM DESIGN BARRELS
Special large diameter barrels are available to accommodate extra large parts. Fixtures hold parts to assure complete, precise finishing of all crevices and surfaces.

SEND FOR NEW ALMCO CATALOGS ON BARREL FINISHING MACHINES MEDIA, AND COMPOUNDS

ALMCO

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Queen Products Division • King-Seeley Corporation

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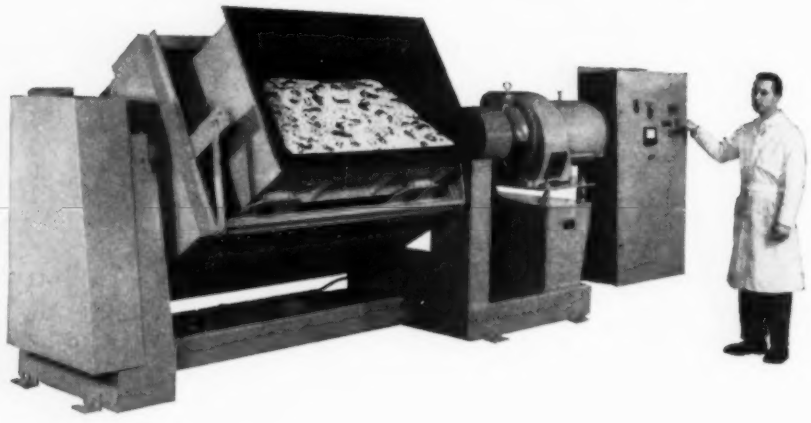

LORCO®
VIBRATORY FINISHING
can be profitable in your business

You don't have to be big to profit from Lorco vibratory finishing. With five years of intense concentration on finishing problems of all kinds, Lorco has developed a complete line of vibratory equipment, engineered and priced to suit every production requirement.

All five Lorco models offer the same advantages of versatility, speed and production economy, regardless of the shape, size, composition or complexity of your work. Delicate parts are finished without distortion. Coarse work requiring heavy stock removal can be quickly deburred or cut down. Shielded and recessed areas are thoroughly finished to the most precise dimensional tolerances.

Whether you need a machine with 1 or 16 cubic feet of load capacity, to finish large pieces in large volumes, or small, delicate parts and lower production requirements, Lorco has the right equipment at the right price. The facts and figures of Lorco vibratory finishing are all in this new, illustrated catalog. Ask for Bulletin 600.

YEARS-AHEAD DESIGN
means outstanding performance

Only LORCO . . . originator of Vibratory Finishing . . . can offer you the world of experience and outstanding machine performance that come from 5 years' leadership in making over 100 successful installations. Write for the valuable help a seasoned Lorco engineer can give you.

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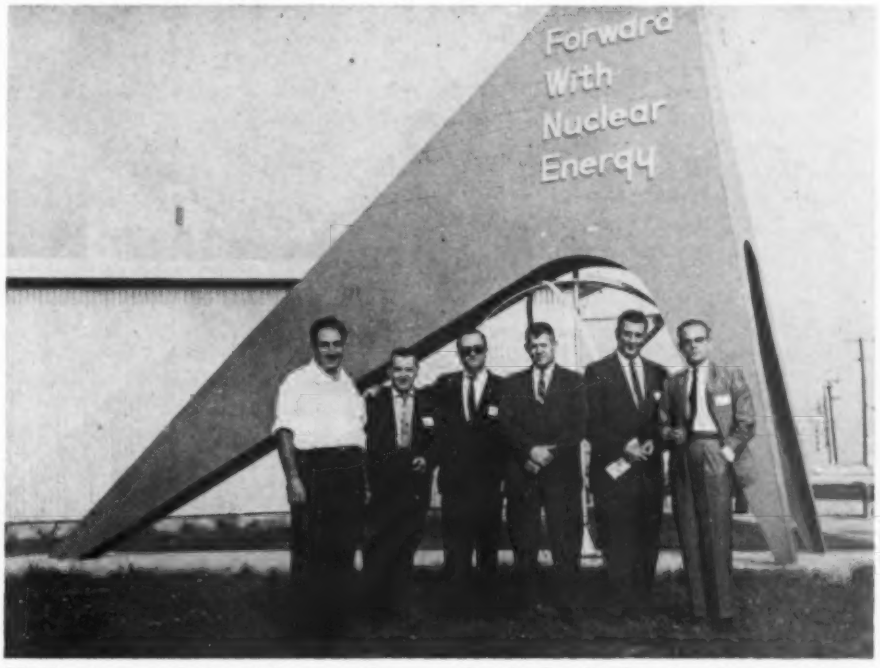
American Society for Abrasives

Michigan Chapters Join in Atoms for Peace Tour

Detroit Chapter was host, and Western Michigan and Saginaw Valley participated enthusiastically in "the first annual statewide informal conference of ASA," a tour of the new Enrico Fermi Atomic Power Plant at Monroe, Michigan, Saturday, September 30.

Eighty members and guests from as far away as Grand Rapids visited the plant, which is still under construction. It was started in April, 1956, and is scheduled for completion later this year.



Half a dozen of the eighty members and guests of the three Michigan chapters pause for photographic purposes during their trip through the Enrico Fermi atomic power plant, Monroe, Michigan. They are (l to r) Louis Small, Service Diamond Tool Co.; Henry Walas, Federal-Mogul-Bower Bearings, Inc.; and Lee Griffith, Clair Hume, Earl Lemming, and Wm. Fletcher, The Cincinnati Milling Machine Co.

Cummings Talks Abrasive Cutting at Cleveland

Curtis Cummings, sales manager for Allison-Campbell Division, American Chain & Cable Company, Bridgeport, Connecticut, spoke on "Abrasive Cutting—Wet and Dry" at the Cleveland Chapter's first meeting, September 8 at the Cleveland Engineering and Scientific Center. Forty-eight members and four guests attended.

He pointed out, among other things, that dry cutting is economical only when the wheel is fed into the work fast enough to prevent glazing.

A board meeting was held after the regular meeting.

Connecticut Discusses Wheel Markings

Kenneth Bates, field engineer of the Norton Company, Worcester, Mass., led a discussion of grinding wheel markings at the first fall meeting of the Connecticut Chapter, September 26. One hundred and ten, including 45 guests, were present.

Introducing a film, "Wheel Markings and Wheel Selection," Mr. Bates used wheel markings from Norton and Carborundum to illustrate the standards adopted by the industry in 1944 as a first step toward simplification.

In the discussion that followed, industry-wide agreement on prefixes for abrasive types was pointed out as a desirable goal to which the ASA might subscribe.

Norton's 75th anniversary film, "Old as the Hills," concluded the meeting.

New Jersey: Tumbling

Slides illustrated a talk on "The Most Versatile Operation in Industry," as **N. L. Watkins**, product manager, Electro Minerals Division, The Carborundum Company, Niagara Falls, New York, spoke at the first fall meeting of the New Jersey Chapter.

The place was the Blue Shutter Inn, Union, New Jersey; the day, September 21.

Movie Premiere for Western Michigan

An English-made movie, "Sparkling Performance," reported as being shown for the first time in the United States outside of Niagara Falls, New York, highlighted a talk on tool and cutter grinding by **William Pollard** of the Carborundum Bonded Abrasive Division at Western Michigan's September Meeting.

The get-together was held at the Pontaluna Country Club, Muskegon, Monday, September 19.

Rubber Abrasives Expert Addresses Chicago Chapter

A veteran in research and production of rubber-bonded abrasive wheels, **Walter F. Wedemeyer** of A. P. deSanno & Son, Inc., of Phoenixville, Pa., spoke at the opening session of the Chicago chapter, American Society for Abrasives. Sixty-five members and guests attended.

His subject was, "The Rubber Bonded Grinding Wheel in Industry," with heavy emphasis on applications and case studies. • • •

JUST SEE THIS PROOF!

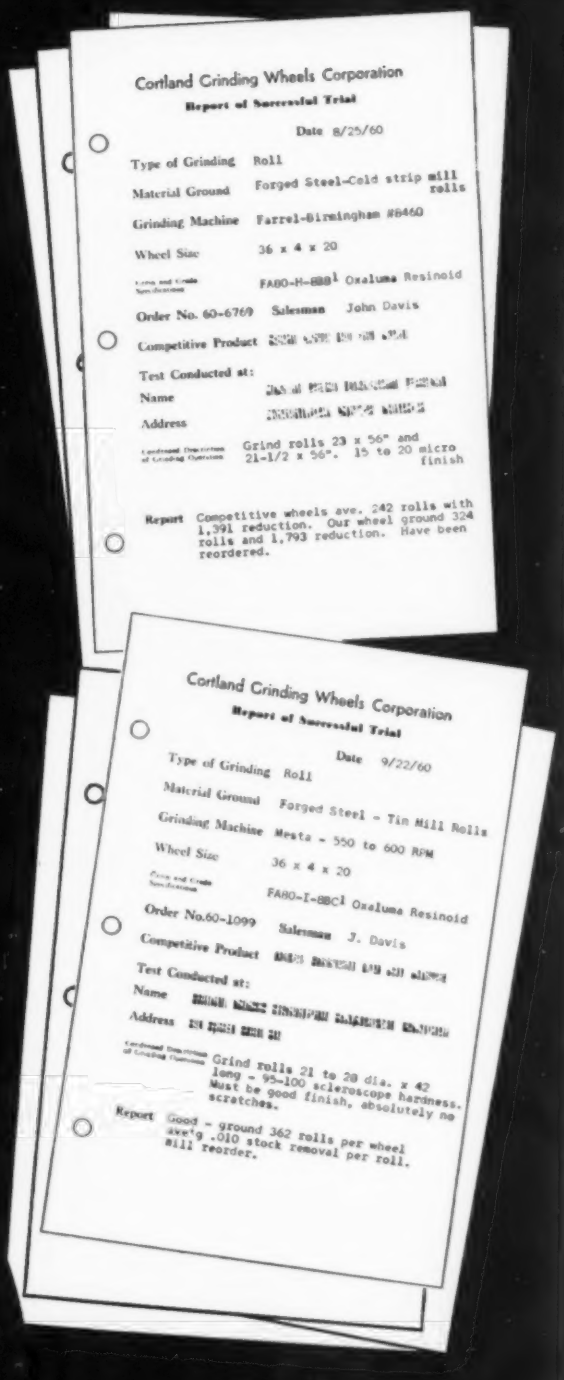
Actual Tests of CORTLAND GRINDING WHEELS

in Tin and Cold Strip Mills Demonstrate Superior Quality

You'll agree that a wheel for roll grinding in tin and cold strip mills must meet unusually exacting demands. So no blemishes, scratches or chatter marks will mar the steel sheets, finish is of prime importance. To generate such finish quickly, the wheel must be free-cutting. And a long productive life is desirable, for economy.

You get *all* these essentials in CORTLAND medium fine grit-range resinoid bonded wheels for grinding steel rolls. For proof, see the recent test reports on the performance of wheels in two large mills. (Only customer's and competitor's names have been omitted.)

Let us prove there is a CORTLAND Wheel that will solve any grinding problem you may have. Write or call to arrange a trial run in your own plant.



Cortland Grinding Wheels Corporation
Report of Successful Trial
Date 8/25/60

Type of Grinding Roll
Material Ground Forged Steel-Cold strip mill rolls
Grinding Machine Farrel-Birmingham #8460
Wheel Size 36 x 4 x 20
FA80-H-BBBl Oxaluma Resinoid
Order No. 60-6769 Salesman John Davis
Competitive Product
Test Conducted at:
Name
Address
Grind rolls 23 x 56" and 21-1/2 x 56". 15 to 20 micro finish
Report Competitive wheels ave. 242 rolls with 1,391 reduction. Our wheel ground 324 rolls and 1,793 reduction. Have been reordered.

Cortland Grinding Wheels Corporation
Report of Successful Trial
Date 9/22/60

Type of Grinding Roll
Material Ground Forged Steel - Tin Mill Rolls
Grinding Machine Mesta - 550 to 600 RPM
Wheel Size 36 x 4 x 20
FA80-I-BBCl Oxaluma Resinoid
Order No.60-1099 Salesman J. Davis
Competitive Product
Test Conducted at:
Name
Address
Grind rolls 21 to 28 dia. x 42 long - 95-100 scleroscope hardness. Must be good finish, absolutely no scratches.
Report Good - ground 362 rolls per wheel ave'g .010 stock removal per roll. Will reorder.

CORTLAND Oxaluma Resinoid Roll Grinding Wheels are available in a variety of grit sizes to meet your exact requirements — and in wheel dimensions to meet your machine needs.

CORTLAND GRINDING WHEELS CORPORATION

Chester, Massachusetts

CORTLAND

23

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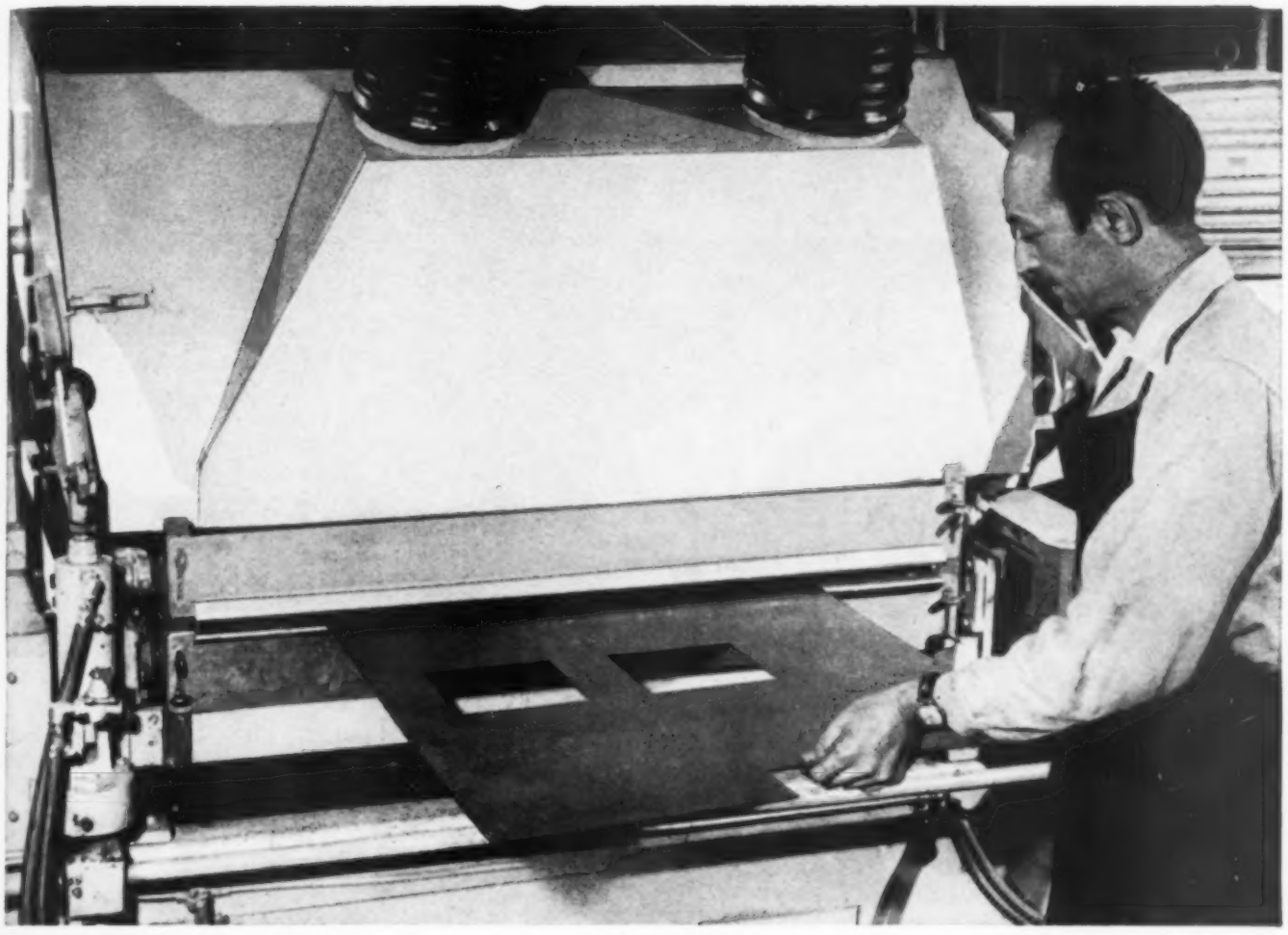

3M Abrasives Help AMF Reduce Sheet Metal Deburring Costs

Innumerable ferrous and non-ferrous sheet metal components are manufactured for cigarette, cigar, bakery, and Automatic Pinspotter Machines at the American Machine & Foundry's Brooklyn, New York plant. Sheared to size and punched, components must then be deburred and cleaned prior to painting and plating. The previous method, using abrasive discs, often left swirl marks which had to be removed in a secondary hand sanding operation at extra cost.

As the result of a recommendation from a 3M Representative, AMF switched to the use of a wide-belt sander and "Three-M-ite" Resinbond Cloth Belts on these operations.

The results were remarkable. The new wide-belt prefinishing method eliminated all extra re-work, provided a better pre-paint surface, and cut unit costs substantially. Unit production time was slashed from more than 9 minutes to less than 30 seconds.

Why not let 3M's new COST CHECK 5-4-5 Program help you to effectively investigate ways to lower costs and increase profits. Discover . . .

- If your grinding can be done more economically
- If your finishing is as efficient as possible
- If your polishing can be done faster and better

Send today for a free COST CHECK 5-4-5 Review Form *without obligation*. Put 3M's years of abrasive know-how at your disposal.

3M Coated Abrasives

SEND IN TODAY

3M COMPANY, Dept. AAH-110.
900 Bush Ave., St. Paul 6, Minn.
Send me my Free COST CHECK 5-4-5 Kit

COST CHECK 5-4-5

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CITY_____ STATE_____

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

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Design for Grinding

RICHARD L. McKEE • Associate Editor

Switch to Blast Deburring Saves $30,000 Annually

Batch blasting of die castings cuts cost of deburring and deflashing, produces better quality than hand operations.

● Big savings in the production of small air-cooled gasoline engines are being made by Clinton Engines Corporation, Clinton, Michigan. Outgo has been cut $30,000 a year on an annual schedule of 900,000 units by eliminating one hand operation: deburring of die castings.

Clinton, one of the largest manufacturers of 2-cycle and 4-cycle engines, sells its products to approximately 750 equipment manufacturers throughout the world. Clinton engines power a wide variety of products, lawn and garden equipment, carts, generators, pumps, and many other applications for farm and industry. The company also makes chain saws and outboards. Many of the engines and accessories are die cast.

Deburring of these die castings was originally set up as a hand operation because no completely dependable mechanical process was believed available. Quality control had to take precedence over all other considerations. But in switching to the blast method this company received a welcome bonus: better quality deburring than ever before.

Now deflashing comes right along with deburring. Trim edges are smoothed, there is improved appearance in the finished casting, and the matte surface obtained with the blast process provides vastly improved paint adhesion.

Savings occur primarily because die castings, instead of being individually handled, are blasted in large batches. For example, 875 reed plates are perfectly deburred in 6 minutes. This time saving cuts deburring cost per piece from $0.0050 to $0.0006. On a yearly schedule of 900,000 this cuts costs by $3,960.

continued

Former method involved individual handling of castings at high labor cost, required more time. Quality depended on operator's dexterity, care.

Pushbutton operation of blast machine is only a part-time operation for one man who also runs a trimming machine and fills the loading device.

HOW BLAST DEBURRING OF DIE CASTINGS CUTS COSTS AT CLINTON ENGINES CORP.

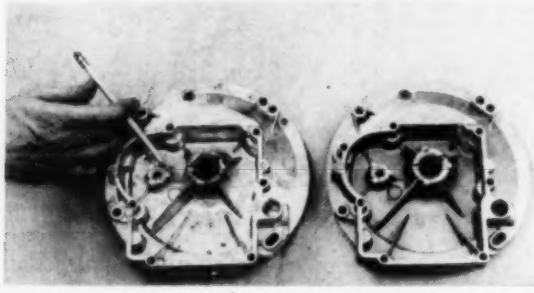
Reed plates:

Former method, each	$0.0050
Rotoblast, each	0.0006
Savings per piece	$0.0044
Pieces per year	900,000
ANNUAL SAVINGS	$3,960.00

Engine bases:

Former method, each	$0.0061
Rotoblast, each	0.0024
Savings per piece	$0.0037
Pieces per year	900,000
ANNUAL SAVINGS	$3,330.00

These examples are considered typical of approximately ten items. Total savings computed at $30,000 per year.



Engine base die casting before and after blast deburring. 70 can be blasted in 3 minutes.

These savings are considered typical of approximately ten items now handled by the new method. Total saving is computed at $30,000 annually.

Significantly, total outlay for the new equipment —blast machine, automatic loader and dust collector—was less than 1/3 of this amount.

In addition to its deflashing and deburring duties the blast equipment is also used for rust removal on various cast iron parts. It is in fact a versatile machine, ruggedly built, with reserve capacity for any foreseeable future expansion in this company's production schedules.

The blast machine is the standard 6 cu. ft. barrel manufactured by Pangborn Corporation, Hagerstown, Md. It is positioned adjacent to the trimming operation so that trimmed parts drop alongside the blast machine's loader. From here the loader is easily filled, pushbuttons pushed and the loading-deburring-unloading cycle set in operation. Both material handling and the blast process are so simplified that the trimmer operator handles both machines without difficulty or delay.

S-170 steel shot is the abrasive used. The blast barrel employs a vaned, centrifugal wheel with a 15 h.p. motor to throw 22,000 pounds of abrasive an hour. It incorporates abrasive cleaning and recycling equipment for effective removal of flash particles, burs, fines and dust from the good abrasive which can then be used over and over again. A Pangborn cloth bag dust collector exhausts the deburring operation. • • •

Announcing the NEW! K.O. Lee SURFACE GRINDER

Model S714H

features:

- ★ A low cost precision grinder designed to handle most of the work ordinarily done on larger machines.
- ★ Spindle has duplex pre-loaded heavy duty ball bearings on each end. Spindle is driven with O-ring type belts for smooth operation.
- ★ Heavy cast iron construction throughout.
- ★ Extra length V and flat table ways distribute weight over greatest practical area for maximum table support and permanent accuracy.
- ★ Table Ways are continuously lubricated, a definite improvement over the manual system.

Finest accuracy and micro-finish obtainable.

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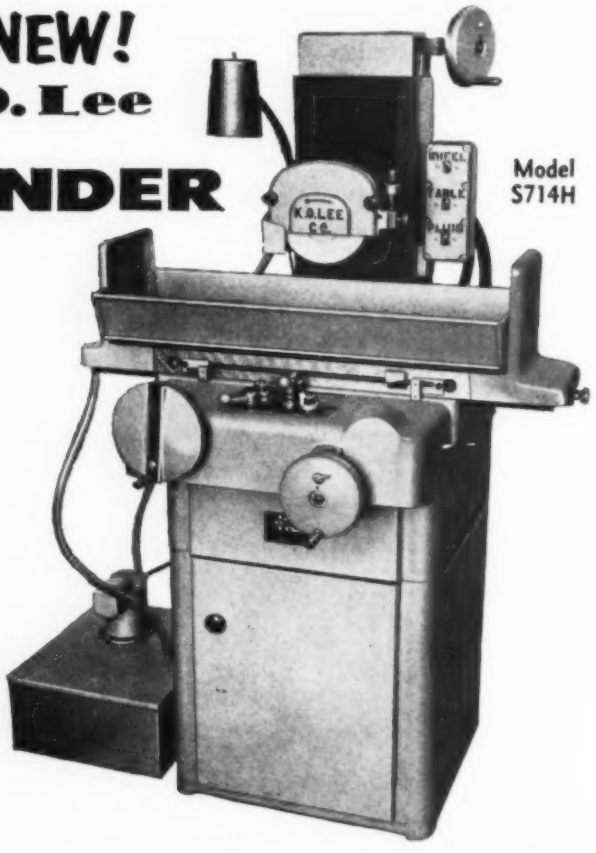

K.O. Lee Company, Aberdeen, S.D.

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Why General Electric Man-Made diamonds are better for you

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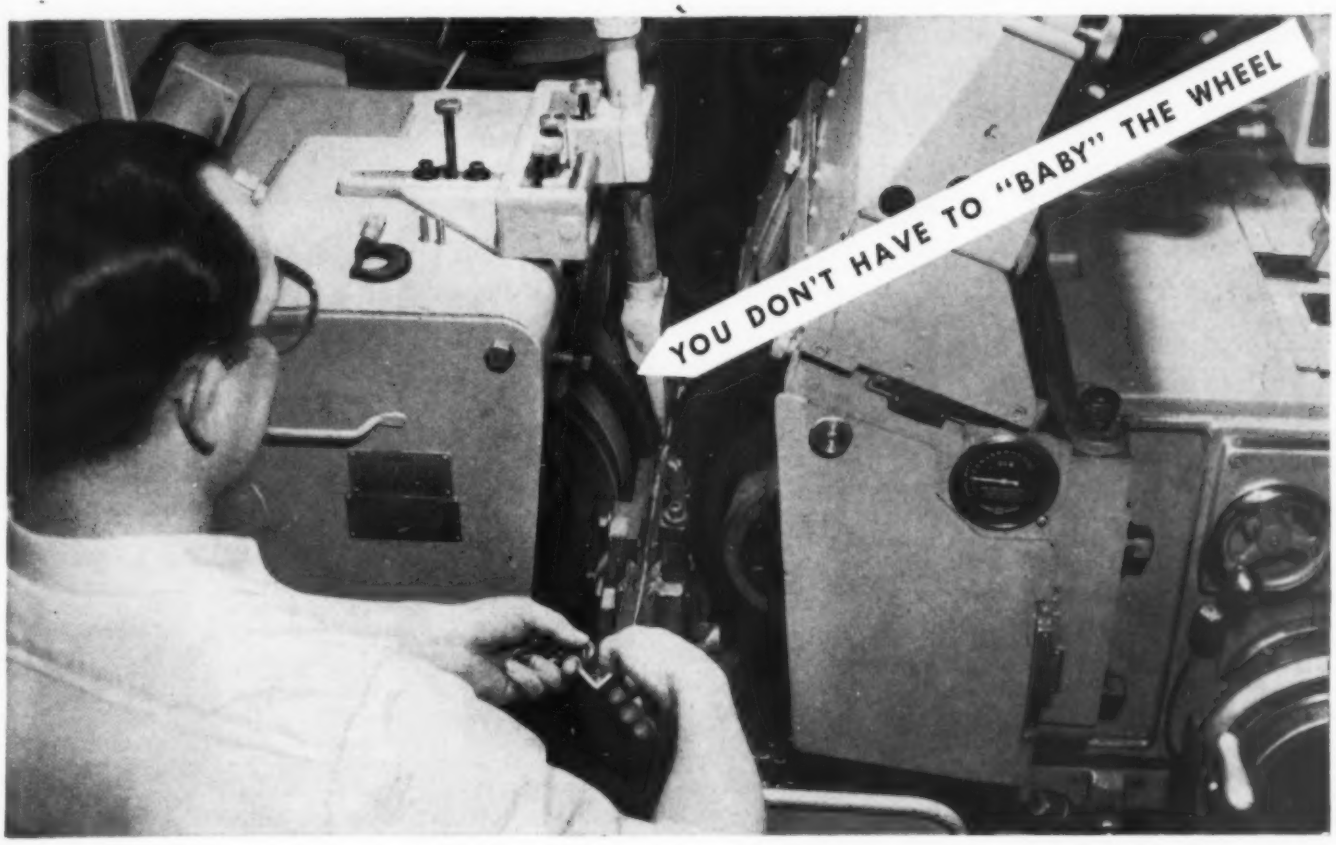
G-E Man-Made diamonds can take it!



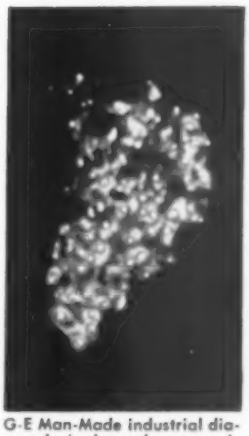
RVG diamonds—with optimized crystals—have built-in qualities that make them superior in wheels for all resinoid and vitrified grinding.

If yours is a heavy-duty grinding operation, wheels containing G-E Man-Made diamonds can take the punishment – and then some! Here's why:

General Electric has improved the crystal characteristics of its Man-Made industrial diamonds for resinoid and vitrified grinding (designated as type RVG). Manufactured under controlled conditions, G-E Man-Made diamonds are of optimum friability and shape to cover wider applications – everything from machining single-point tooling to grinding carbide-and-steel mixtures (even up to high ratios of 50-50!).

And because G-E Man-Made diamonds are irregular blocky crystals with rough surfaces, they stay bonded longer . . . so, you get more mileage per wheel. Wheels containing General Electric Man-Made industrial diamonds are available in ample supply to meet your needs.

Have you looked into the advantages of grinding wheels containing General Electric Man-Made diamonds lately? Better talk it over with your grinding wheel supplier today. *Metallurgical Products Department of General Electric Company, 11177 E. 8 Mile Road, Detroit 32, Michigan.*



G-E Man-Made industrial diamond (enlarged approximately 140 times) with optimized crystal characteristics can be used in wheels for every resinoid and vitrified grinding operation.

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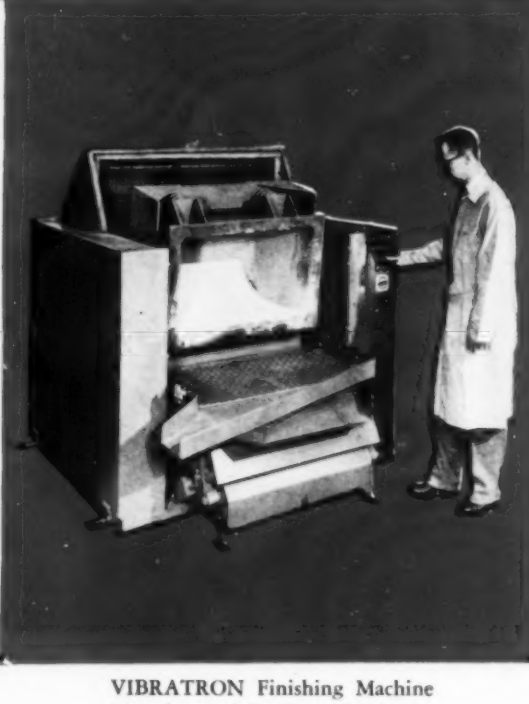
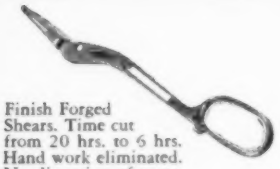
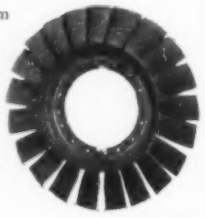




Finish Forged Shears. Time cut from 20 hrs. to 6 hrs. Hand work eliminated. No distortion of parts.

Deburr and Polish steel caster horns. Time reduced from 6 hrs. with 2 compounds to 1½ hrs. with 1 compound.

Deburr Aluminum Rotor Fan. Previous method hand deburring. VIBRATRON Process, 10 parts per hour. No hand work required. Greatly improved surface.



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The Vibratron increases production of cast, forged, stamped and machined parts up to 100%. It cleans, descales, deburrs, forms radii, fine finishes and colors. Equally important . . . parts with hard-to-reach shielded and internal surfaces can be effectively finished. The Vibratron produces finishes quickly, because the induced vibration produces abrasive action throughout the entire mass and works on all surfaces — internal and external — of the parts being processed. EXOLON abrasive shapes of strong, dense, rugged aluminum oxide fused in the electric furnace contribute to the success and high production of this fast finishing Vibratron process. Write for complete information.

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Ideas from the Shop

Device "Fingers" Reversed Roller Bearings

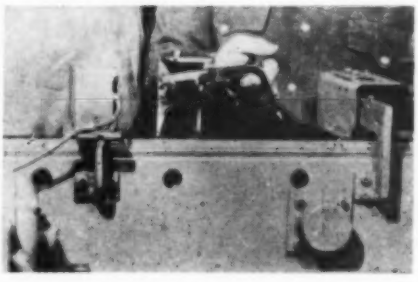
A device to keep reversed rollers from feeding into roller grinding machines has been installed at Timken's Columbus, Ohio, Railway bearing plant.

The smaller end of each roller must enter the grinder first. When a roller in this position reaches the device, a metal finger, the finger rides up the taper and drops back into position.

If the roller is reversed, the finger hits its large end and stops it. The roller can then be removed by hand, and the operation continues.

Prior to the installation of the new device, an occasional roller would reverse itself as it came into the conveyor which feeds the grinder. When this reversed roller entered the loading tube, it jammed the loading fixture. The machine had to be stopped so the reversed roller could be removed.

On occasion, a roller would enter the grinder in a reversed position, resulting in damage to the feed wheel and to the grinding wheel. Production had to stop while repairs were made.



An operator holds up the "finger" with his right hand. Rollers in the correct position, small end first, strike the tapered section at the end of the device. Reversed rollers, large end first, hit the flat of the "finger" and stop.

This new method of detection has eliminated this type of production stoppage, which means considerable savings in downtime and reduction in maintenance.

Make Full Use of Abrasive Belts

By Charles G. Tuvek

It is customary to discard worn abrasive belts, but many of these belts have areas of almost untouched abrasive which is still usable. These strips of good abrasive can often be slit from the wider belt and used on narrow contours or on places which cannot be reached with the wider belts. Cloth belts can frequently be torn to the desired width once a slit has been started with a knife.

Salvaging belts in this fashion provides a source of supply for narrow widths which it would not otherwise be economical to stock.

When belts are slit in this fashion, it is a good idea to check and see that the direction of rotation is indicated on the salvaged portion, especially if it is to be used as a new belt.

Strips salvaged from belts are also useful in finishing work on a bench lathe or similar equipment.

Carbide Liner Lengthens Periphery Guide Life

By J. Giamalis

The periphery guide for the Gardner double disc type surface grinder is subject to wear from pressure and friction resulting from holding work pieces in position between grinding wheels. When wear becomes excessive, the guide requires re-working and chrome-plating, which is expensive.

The installation of a carbide lining on the wear surface of the guide has yielded twenty times the life of the chrome-plated surface, to say nothing of the saving in time and money over the previous method. My company figured that this change saved $7,500 per year.

Shop Kinks from Clover

• **Reluctant pipe joints** that will not screw down far enough can be coaxed into place with a bit of Clover Compound. Apply the Compound to the threads and work the joint back and forth several times. The same method can be used on bolts and nuts, or on any screw-thread system.

• **Lapping may be accomplished** in many cases with jigs or setups for grinding. Substitute a cast iron or lead lap for the abrasive wheel, apply Clover Compound and rotate the **wheel** at less than one-tenth the speed used for grinding.

• **To sharpen knives,** plane cutters, and similar tools, a little Clover Compound on a piece of plate glass or smooth cast iron makes an ideal sharpening stone. Finish the edge with the same Compound (or finer grade) on the end grain of a block of hard, close-grained wood.

• **When small-shaped stones or files** are not available, cut the shapes from hard wood or soft metal, apply Clover Compound and you have an effective tool. Some mechanics prefer shapes made in this manner for such tasks as polishing dies. These **shapes** don't break and it is easy to make up special ones.

• **A good polishing cloth** can be made from a strong rag to which some finer Clover Compound has been applied. It will keep indefinitely. The worse it looks, the better it works. Use it to polish brass, silver, or, sparingly, to remove spots from chrome. Do not use it on nickel plating.

(Courtesy Clover Manufacturing Co.)

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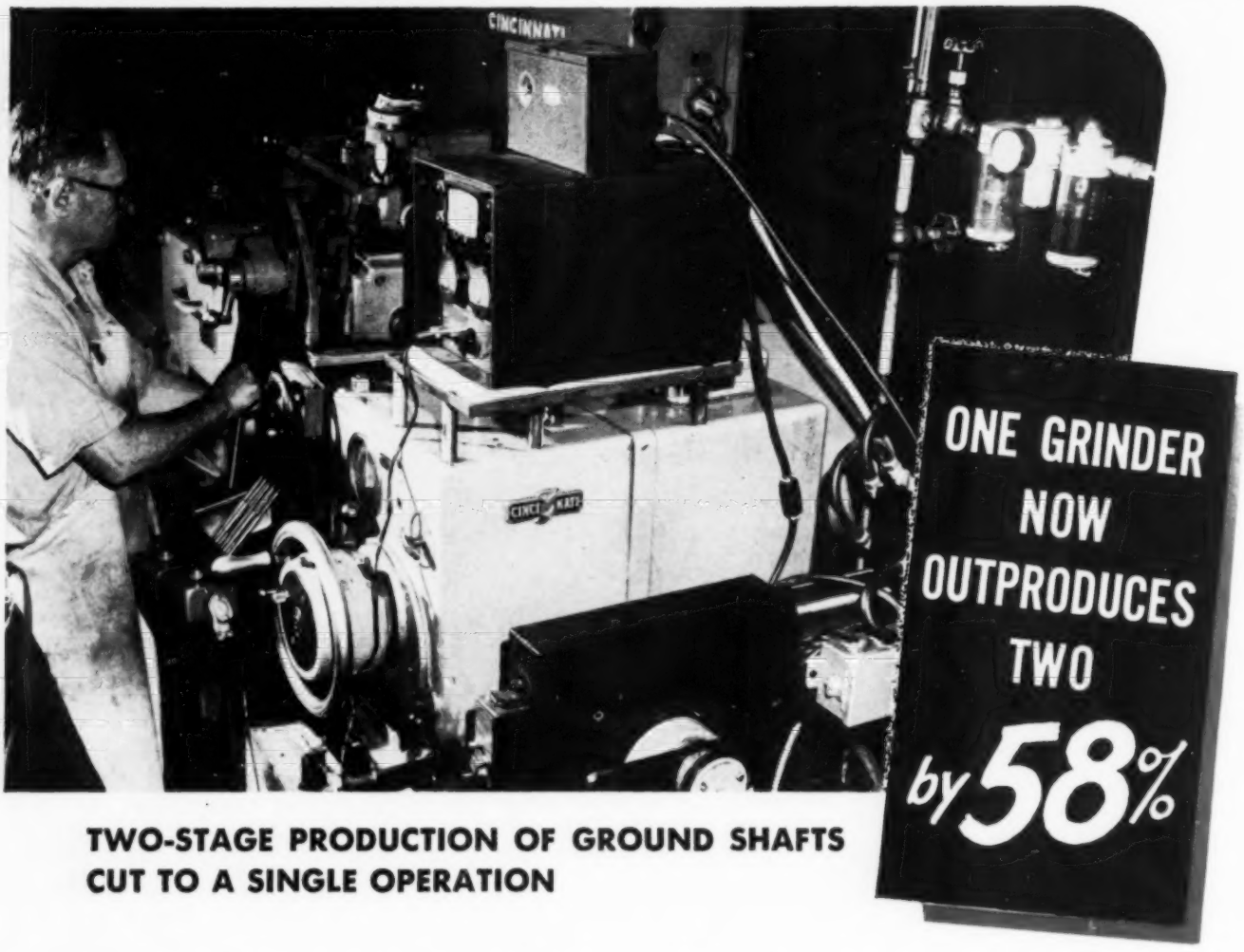

TWO-STAGE PRODUCTION OF GROUND SHAFTS CUT TO A SINGLE OPERATION

At the Cleveland, Ohio, plant of General Electric Company's Vacuum Cleaner Department, grinding four steps and a taper on a 6" shaft was formerly a two-stage operation, with two centerless grinders producing 713 pieces in an eight-hour period.

Today a single grinder — equipped with a Bel-Air Power Feed — produces 1128 pieces in a single operation. What's more, rehandling of workpieces between operations has been eliminated, and the consistently closer tolerances have allowed statistical sampling to replace the gauging of each finished shaft.

This experience is typical of those reported by users of the Bel-Air Power Feed, a unit consisting essentially of a special Bellows Power Feed linked to a modified MICROtrol Unit manufactured by Airborne Instruments Laboratory division of Cutler-Hammer, Inc. Designed primarily for use with a Cincinnati #2 Centerless Grinder in applications for infeeding parts which are not ground over their entire length (headed pins, rounds or pins of divided diameters, etc.), the Bel-Air Power Feed offers the user a unique combination of advantages, including:

- **Work held to .0002" in production quantities . . . to .000070" on parts smaller than ½".**
- **Pre-determined finished size obtained through constant monitoring by electronic unit.**
- **Pre-grinding is eliminated — variations in sizes of workpieces do not affect finished size.**
- **One knob adjusts for size during operation.**
- **Compensation can be made for wheel wear, variations in machine elements and operating conditions without shutting down.**
- **Can be set for both coarse and fine feeds.**
- **Can be set for either continuous cycling or single cycle operation.**

850-C

IT COSTS YOU NOTHING TO INVESTIGATE

Find out how you can cut your grinding costs with the Bel-Air Power Feed. Write today for complete information — no cost or obligation, of course. Address Dept. GF-1160 Bellows-Valvair, Akron 9, Ohio.

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Pressure blasting saves you time and trouble in plenty of metal cleaning jobs.

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With Norton ARROW-BLAST abrasive you get other important savings. ARROW-BLAST abrasive is composed of ALUNDUM* fused alumina grains — characteristically hard and sharp for extra fast cutting action — tough, strong and blocky for high resistance to breakdown.

That's how ARROW-BLAST abrasive assures longer, more useful service life and lower cleaning costs. Also, contrasted with sand-blasting, ARROW-BLAST abrasive cleaning eliminates hazards. Dust is held to a minimum, allowing maximum visibility.

For maximum savings in compression cleaning, add Norton NORBIDE* pressure blast nozzles. Molded of the man-made material that's next to diamonds in hardness, NORBIDE nozzles last longer than any other you can buy, and give exactly the type of cleaning stream you need, from broad to pencil-thin. For quick service on ARROW-BLAST abrasive and NORBIDE nozzles, see your Norton Distributor. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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Grit Hardness and Toughness - -

How Does It Affect Your Grinding Operation?

By OTTO L. FORCHHEIMER
Manager, Chemistry Division
Trionics Corporation

● Hardness has for years been regarded as the essential property of an abrasive material, since soft materials have difficulty in abrading harder materials. Its importance may, however, have been over-emphasized in the past.

The development of zirconia as a useful abrasive in spite of the fact that it is less hard than aluminum oxide, for example, has shown that other properties—in this case toughness—may play equally important roles.

Both concepts are vague, since they have been used to describe a number of varied, though related properties. Some idea of their range of meanings, however, is useful in gaining a better understanding of abrasives and their end uses.

Two definitions for hardness which demonstrate this lack of uniform meaning are:

1. "A hazily conceived conglomeration or aggregate of properties, more or less related to one another." (1)
2. "Hardness testing is a valuable, non-destructive method for classifying compounds and their relative resistance to transient and permanent deformation." (2)

It is therefore important to tie hardness and toughness down to more specific meanings. This can be accomplished by specifying the test method used to measure the properties.

HARDNESS

Mohs Scale

The traditional scale of hardness was built by trial—discovering which materials would be able to scratch other materials. An arbitrary scale was set up (Mohs Scale) on this basis. This scale has ten standards for hardness with hardness numbers from the softest (1) to the hardest (10) materials. It is not linear and does not indicate the large differences in hardness among the hardest materials falling in the range between 9 (corundum) and 10 (diamond).

Knoop Hardness

A more meaningful measure is that based on the definition of hardness as the resistance to penetration by another material—"penetration hardness." One method of evaluation in accordance with this definition measures the indentation made in the material by a diamond point under load. Although a number of variations of this method are used both for determination of hardness and of microhardness, the one most current in the abrasive technology is Knoop hardness, for which the result is usually given in terms of

Hardness and toughness are two of the most essential qualities of abrasive grain—and two of the most confusing. This article defines and distinguishes between them, as well as relating them to various applications of the most-commonly used abrasives.

kilograms of load per square millimeter of indentation. Comparative data appear as follows:

HARDNESS		
Material	Mohs Scale	Knoop Hardness kg/mm²
Diamond	10	8000
Silicon Carbide	9—	2500
Aluminum Oxide	9	2050

Ideally, penetration hardness measures resistance to plastic flow. In order to approximate this ideal for brittle materials a very small indentation should be made under low load and a low rate of application of load (microhardness determination). During many determinations some cracking of the crystal takes place in addition to yielding to the indenter by the plastic flow mechanism.

Effect of Crystal Position

Hardness will vary somewhat with the position of the crystal when subjected to indentation; for example, the hardest plane of silicon carbide is parallel to the basal plane, the softest is parallel to the c axis. Grinding tests with oriented crystals have shown that grain orientation can give measurable differences in grinding results. The hardness numbers obtained will also vary with the care taken in their determination.

Hardness is a necessary property for an abrasive. Although in some cases it has been possible to grind a harder material with a slightly softer material, this is not generally the case. For example, aluminum oxide is usually not effective in attacking dense ceramics, but silicon carbide is hard enough to penetrate them.

Hardness is not, however, the only requirement to make a substance a useful abrasive. Even if a material is sufficiently hard to penetrate another material, will it do so without crumbling? The resistance of a material to breakdown under impact loading is one definition of toughness.

TOUGHNESS

Toughness is often considered the most important variable in abrasive technology. This property is considered with the resistance of the grain to breakdown under the forces acting upon it during grinding. Not only are these forces different in different abrasive applications, but also it is difficult to devise a simple test for toughness which will reproduce the stresses created by even one grinding application.

Two Types of Tests

Tests have therefore been devised which either test the inherent toughness of the abrasive material or its operational toughness. In either case, toughness is actually defined by the analytical method employed to determine it. Friability is the reciprocal property to toughness and is sometimes used in its place when describing the action of abrasive crude or grain.

The importance of toughness stems from the fact that it governs the grinding ratio for most grinding jobs, that is, the ratio of volume of metal removed per unit volume of wheel lost. For a particular abrasive grain, e.g., aluminum oxide, and a particular work piece, the tougher the abrasive the higher will be the grinding ratio. The toughest grain is not, however, always the best grain since the grinding wheel must break down at a desired speed in order to give the wheel dressing and the surface finish required.

Chemical Reaction Important

Chemical interaction between the grit and the work piece is also of importance. For each particular grinding job there is an optimum combination of properties which will lead to the greatest efficiency. The considerable range of toughness in which aluminum oxide grains are available, combined with the wide variation in processing methods developed by the abrasive tool manufacturers, provides the best tool for many jobs.

The most meaningful operating definition of toughness to the abrasive industry is one which would make it possible to devise a test which would give results paralleling those obtained during actual grinding conditions. The forces on individual grains in abrasive tools during abrading action have not yet been completely resolved. They vary to some extent in different abrasive applications as well as with the conditions of use of a particular tool.

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Operational Toughness

The resistance of the grain to shattering due to impact is certainly of primary importance. Resistance to impact is therefore widely used as a definition of toughness. One test method consists of shooting the grains by centrifugal force against a steel plate and calculating a "Toughness Number" from the resulting breakdown of the grains. The toughness (or friability) found by this method is closely akin to the resistance to (or ease of) breakdown during actual grinding conditions when comparison is made on similar grinding jobs. Another method which gives similar results is a ball mill test where a toughness number is calculated from breakdown under standard conditions. Results from these two tests correlate quite well.

Operational definitions of toughness for abrasive grains are very useful since the test methods they imply give results which are proportional to grinding toughness. Such toughness numbers may not correspond to an inherent toughness of the material under test (such as aluminum oxide crude).

Theoretical Toughness

A more theoretical toughness, as an inherent property of materials, may be defined in a different manner. One such definition which has been proposed arises from the following test method. A cylinder of the material, preferably monocrystalline, is subjected to a compressive stress longitudinally and strain is measured around the circumference at the middle. The area under the stress-strain curve is then defined as a modulus of toughness. (3) Such a method may well measure an inherent property of the material, but it would not necessarily be proportional to grinding toughness.

An example of this lack of relationship that can occur is the fact that some crudes from which very tough grain is obtained may crush more easily than a crude which crushes to a less tough grain.

Another example is shown by silicon carbide, which is inherently tougher than aluminum oxide, but which in grain form is less tough in large grit sizes due to porosity and shape factors

FACTORS AFFECTING TOUGHNESS OF ALUMINA

Crystal Size

Multicrystalline grains of small crystal size are generally tougher than grains which are monocrystalline or consist of a number of large crystals, chemical composition and all other factors held constant. An explanation of this phenomenon is that in a monocrystalline grain there will be cleavage planes along which the crystal can be separated more easily than if the force is applied along other directions. A multicrystalline grain, on the other hand, consists of a number of interlocking crystals with no one general cleavage plane. A grain in use will be subjected to a number of stresses. Surface cracks or other imperfections can act as centers along which such stresses are relieved, causing fracture. In a monocrystalline grain such fracture will travel through the whole grain; in a multicrystalline grain the fracture may be stopped at the crystal boundary. This effect may be heightened in a sintered grain where the crystal boundaries within the grain may be stronger than the grains themselves. There are, in addition, other factors whose effect is not yet too well understood. For instance, fine crystal grain tends to have more matrix material along the crystal boundaries than coarse crystal grain.

Chemical Composition, Porosity

The toughness of alumina abrasive grains can be varied over a wide range by changing their chemical composition by only five per cent. The following table shows the variation in composition and toughness (impact toughness) of grain made from a number of standard crudes.

TYPICAL CHEMICAL ANALYSES

		Regular	Semi-Friable	White
Alumina	Al_2O_3	95.5	97.0	99.5
Titania	TiO_2	3.0	2.0	Trace
Silica	SiO_2	1.1	0.7	0.1
Iron Oxide	Fe_2O_3	0.3	0.2	Trace
Lime	CaO	0.1	0.1	—
Soda	Na_2O	—	—	0.4
Relative Toughness		53	48	40

The toughness figures used above are for 16-grit wheel grains which have not undergone any further special processing such as shaping. The "regular" grain is the toughest aluminum oxide available as far as composition is concerned. However, it can be made still tougher by the use of microcrystalline fused crude or microcrystalline sintered grain. "White" aluminum oxide grain, which is crushed from crude made by fusing calcined alumina (bauxite is not used as a raw material), is the least tough. Many compositions and gradations in toughness exist between these

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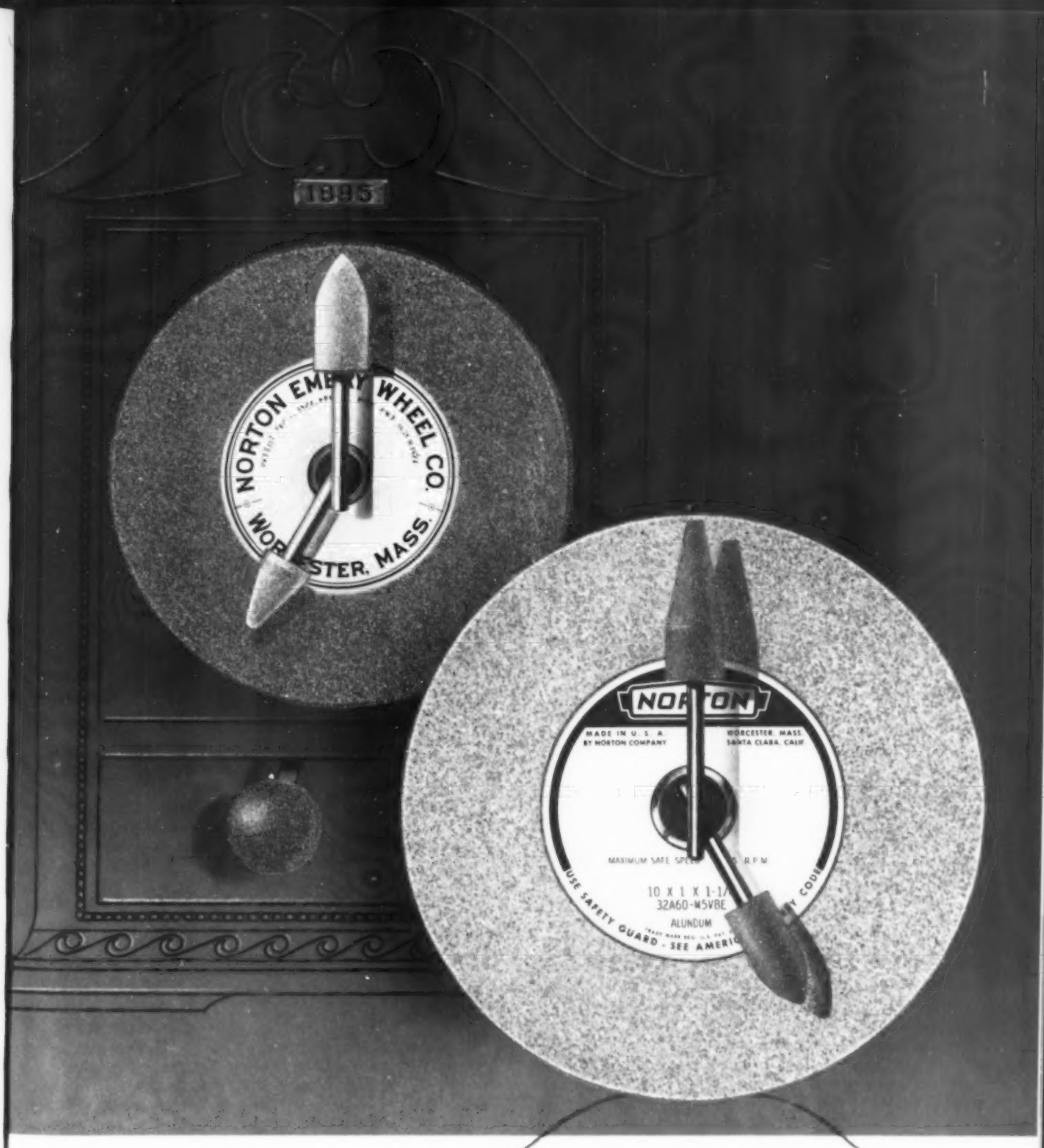

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Today, Norton Company looks forward with equal confidence to its continued growth under sound financing, progressive management and with loyal employees. And it looks back with pride upon 75 years of steady progress in developing and applying the world's largest line of abrasives to meet the needs of industry.

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4-60

two extremes. They may be made either by removing more silica and titania from bauxite starting materials or by adding ingredients to calcined alumina.

As can be seen from the table, the toughness number increases with increasing titania and silica content. Again, no completely satisfactory explanation has been put forward. When the titania concentration is low, most of the matrix material (sometimes identified as iron titanate) is distributed within the crystals. When the titania content is higher, more of the matrix material is found on the crystal boundaries and less within the crystals. The presence of a larger amount of matrix material on the crystal boundaries in the tougher grain is consistent with the findings for the tougher microcrystalline grain. That this phenomenon has an effect on toughness has not yet been definitely established.

In the case of "white" aluminum oxide, the porosity of the grain is one of the main reasons for the increased friability; porosity probably has a larger effect here than composition. As has already been mentioned, the inherent toughness of silicon carbide as a material is not observed in grain of larger grit sizes due to the porosity of the grains.

Grit Size

The table relating toughness numbers to composition of alumina abrasive grains gave data for size-16 grit. Toughness numbers must always be compared for the same grit size, since toughness varies with grit size. Indeed, as was shown in the section on toughness measurement, determination of toughness involves measuring the sizes of grit after some standard method of breakdown—hence, it is necessary to start with a standard grit size. The testing method itself is affected by grit size, and corrections are difficult to make. In addition, there may be shape differences between various grit sizes of the same type of grain for which it is difficult to make arithmetic corrections in toughness numbers. In view of these considerations, it is difficult to obtain a good estimate of the variation of toughness versus grit size, and hence no attempt is made to give any actual illustrative data in this article.

Shape

The following table indicates the effect of grain shape on toughness. The composition of the grain used as an illustration is that referred to as "regular" in table of typical chemical analyses above.

EFFECT OF GRAIN SHAPE

Grain	Toughness Number
Wheel grain (blocky)	53
Specially mulled wheel grain (very regular in shape)	64
P & C grain (roll crushed, not blocky)	44

Roll crushing provides a sharp grain of less regular appearance which has the lowest toughness. By means of mulling, the most cubical, regular shape can be obtained and such grain will be the toughest. The toughness numbers in the above table are actually somewhat misleading since only a part of the large difference in toughness can be attributed to shape differences. To accentuate these differences, advantage is taken of another variable which affects toughness of alumina grains—roasting of the grits as one of the final stages in processing.

The effect of shape can be attributed at least in part, to the cross section of the grain which must be fractured for breakdown. The more regular in shape, the larger is the cross section through possible planes of fracture.

Roasting

The toughness of aluminum oxide abrasive grain can be enhanced by roasting the grain after it has been crushed to size. This process is merely one of heating the grain to a predetermined temperature for a well-defined period of time. Within limits, the time and temperature used control the final toughness of the grain.

The mechanism by which toughness is increased on roasting has not been satisfactorily resolved. Changes take place in the oxidation state of the titania present and, as a consequence, the matrix material changes in nature; at some temperature a partial extrusion of matrix material takes place. The surface of the grains is also affected by roasting; it is possible that surface strains are relieved and minor imperfections repaired. • • •

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What Function Do Grinding Fluids Perform?

Metal cutting can be used as a starting point in the application of fluids to grinding. Correct application of oils and water based fluids and an understanding of their benefits can improve your grinding operations. In most cases extreme pressure soluble oils provided the best balance of benefits.

By JOHN L. MURRAY
Esso Standard, Div. of
Humble Oil & Refining Co.

● The subject of grinding fluids and the grinding process can be approached in several ways. In this discussion we will start by talking about metal cutting and cutting fluids. This apparent anomaly is appropriate because grinding is an extremely complex process that is very poorly understood. Far more research has been done on metal cutting and, in its simplest form, grinding can be considered to be a cutting operation. Although obvious similarities exist between grinding and cutting, the differences are important and must not be overlooked.

METAL CUTTING AND CUTTING FLUIDS

The cutting process can best be understood by examining the situation that exists at the tip of an idealized cutting tool. Figure 1 represents the cutting zone as the chip is formed, and shows the chip as it slides over the face of the tool. Heat is generated in essentially two ways: by deforming the metal along the shear plane indicated in

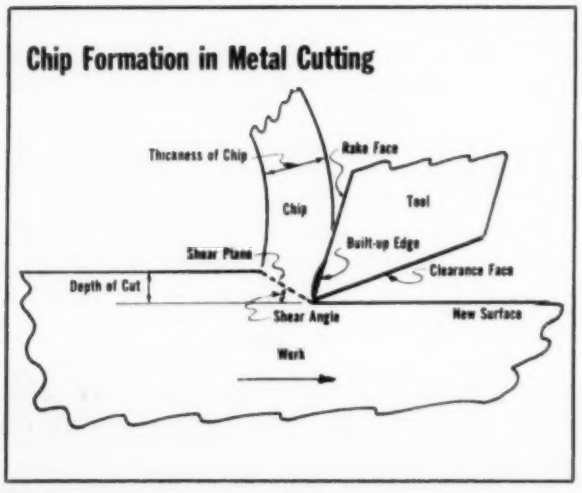

Figure 1

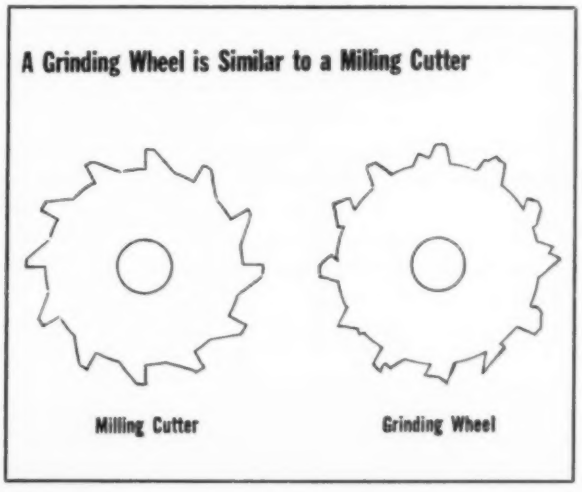

Figure 2

Surface Grinding Die Steel
(46-grit oxide wheel)

Wheel Grade	Grinding Ratio (G)*		Power Req'd (hp)	
	Oil	Emulsion	Oil	Emulsion
H-Soft	8	3	0.30	0.44
J-Medium	19	5	0.39	0.49
K-Hard	43	7	0.40	0.49

*Ratio of metal removed/wheel wear

TABLE 1

the figure, and by the frictional forces on the chip as it rubs against the rake face of the tool.

The important variables studied in metal cutting research include temperatures, tool wear, forces on the tool, and shear angle (which is related to friction on the tool face). Another obviously important variable is surface finish of the newly cut surface.

The over-all aim in any metal cutting operation is to manufacture the required parts at the least cost per piece. This goal can generally be approached by taking steps that reduce tool wear, or that allow the operation to be carried out at a higher cutting speed without sacrificing tool life. Since tool wear is directly related to tool temperature, the primary object in using a cutting fluid is usually to reduce the tool temperature. This can be done in two ways: by preventing heat generation through the use of a good lubricant or by carrying away heat through the use of a coolant. A lubricant will reduce frictional heat. In addition, reducing tool chip friction changes the force relationships at the tool tip in such a way as to increase the shear angle, consequently reducing shear energy and heat. The value of a coolant in carrying away heat is obvious.

COMPARISON OF METAL CUTTING AND GRINDING

There are many obvious similarities between cutting and grinding. In both operations, chips are removed by shearing of the workpiece by the cutting tool, which in the case of grinding is the individual abrasive grain. Comparisons have been made to show the similarity between grinding wheels and a multi-tooth milling cutter. Figure 2 illustrates this. However, there are important differences between cutting and grinding. The geometry of the grain of abrasive is generally unknown, compared to the well-defined shape of the cutting tool. In addition, grinding chips are very much smaller than those produced in cutting, and grinding is usually done at speeds of 6,000 surface feet per minute or faster, far higher speeds than are usually used in cutting.

Crush Dress Grinding

	Fluid	Pieces Ground	Wheel Wear, mils	Power, kw	Finish, rms
60-grit wheel on soft steel	50/1 Emulsion	10	6	5.2	65
	Oil	10	6.5	3.2	45
200-grit wheel on hardened steel	50/1 Emulsion	3	8.4	5.5	45
	Oil	10	6.5	3.1	92

TABLE 2

In grinding, as in metal cutting, the objective is usually to produce specification parts at the least cost per piece. The finished part must meet surface finish and size requirements as well as have no metallurgical damage to the surface such as burns or stresses. For the operation to be successful, the wheel wear must be low and the wheel must not glaze or load, conditions that are comparable to the build-up edge in metal cutting. The grinding fluid must help to give good surface finish, reduce wheel wear, and minimize loading of the wheel. In addition, the proper grinding fluid can significantly reduce power requirements and reduce surface stresses on the ground piece. Other desirable properties of the grinding fluid include low toxicity, minimum fire hazard, low cost, and good corrosion protection. Also, the fluid must be easy to filter and be reasonably clean to use. Obviously, the fluid for any given operation must meet as many of these objectives as possible.

Fluids used in grinding (or metal cutting) can be classified as either oils, which are used "as received," or water-based fluids, which are mixed with water before they are used. The oils usually contain extreme pressure lubricating additives such as compounds containing sulfur, chlorine, or fatty materials. The water-based products are usually either soluble oils (oils that are mixed with water to make emulsions) or the synthetic or so-called solution type fluids, which contain little or no oil and generally have poor lubrication properties. Fortunately, it is possible by proper formulation to build into soluble oils those properties which will provide effective lubrication in the emulsion.

LABORATORY RESEARCH ON GRINDING FLUIDS

Laboratory research under controlled conditions is essential for a better understanding of the grinding process. However, only a small amount of research has been reported in the literature. This work has been done largely by abrasive manufacturers and, in some cases, sponsored by trade organizations. Although the work has been done in different laboratories, in many different kinds of grinding operations, the published reports all reach the same conclusion. In every case investigated, grinding oils (not water-base fluids) gave the best results.

The results of one series of surface grinding tests on die steels are summarized in Table 1 (1) Grinding oil gave lower wheel wear than emul-

sion did, and also lower energy requirements. The same results were obtained on softer H-grade wheels as well as on harder K-grade wheels, and at grit sizes from 46-grit up to 150-grit wheels. It was concluded that the lubrication provided by oils was much more important in minimizing the generation of heat than was the ability of the water-based fluids to carry away heat once the heat was generated. Another series of tests was run in a crush dress grinding operation and gave the data recorded in Table 2 (2). When a 60-grit wheel was used grinding soft steel, wheel life was essentially the same for either oil or water-based fluids, but oil required only 60% as much power and gave a better surface finish. When hardened steel was ground in the same operation using a 200-grit wheel, 10 pieces could be ground satisfactorily with oil, while only 3 pieces could be ground with the emulsion. In addition, power requirements were less and surface finish better with oil than with the water-based fluids tested.

The superior performance of grinding oil is further illustrated by the data in Table 3. In these tests on hardened high temperature alloys, sulfurized oil reduced wheel wear by 4 to 6 times, as compared to a chemical emulsion. Results with a rich (10/1) soluble emulsion were somewhat better than with the chemical emulsion, but neither approached the low wheel wear obtained with the sulfurized oil. (8)

Oil has also proved to be far superior to water-based fluids where residual stresses in the ground piece are important. Tests on the grinding of steel showed that neither water plus nitrite nor soluble oil emulsions gave lower stresses than were obtained when grinding dry. Data are summarized in Table 4 (3). Oils gave far lower stresses in the workpiece than did any of the water based fluids and the best oil was the product highest in additive content (therefore the most expensive). Since the residual stresses are due largely to heat, it is obvious that the better lubrication provided by the oil reduced the heat generated, and this was far more effective in reducing stresses than attempting to carry away the heat with the water-based fluids.

Although there are undoubtedly exceptions to the general conclusions reached by these tests, the fact that the conclusions are unanimous indicates that a new look is necessary in many grinding operations. Oils should give lower wheel wear, better surface finish, reduce energy required for the grinding operation, and leave lower stresses in the workpiece than the water-based fluids widely used.

LAB TESTS VERSUS FIELD PRACTICE

The value of any laboratory work depends on whether the information can be translated into practical shop practice. In operations where wheel wear is critical, such as thread or form grinding, oils are always used to minimize wheel wear and improve surface finish, exactly as indicated by the laboratory work. The grinding oil is fully justified by the accuracy required, the high cost of the wheel, and simply by the fact that many of these jobs couldn't be done without the good lubrication properties of oil.

SURFACE GRINDING HIGH TEMPERATURE ALLOYS
(46 grit oxide wheel—6000 sfpm)

	Grinding Ratio (G)*	
	A-286 Cr-Ni Alloy	Inconel 700 Ni-Based Alloy
Chemical Emulsion (40/7)	8	2.5
Soluble Oil Emulsion (10/1)	12	4.0
Sulfurized Oil	31	15

*Ratio of metal removed/wheel wear.

Table 3

In most grinding operations where no form or shape is involved, such as centerless, surface, and other common grinding operations, water-mixed fluids are used as a practical compromise to avoid the problems associated with oils. Oils are higher in cost than the emulsion or water mixture in the machine. In addition, oils can create a mist and fire hazard if not vented properly and can cause a health hazard by excessive breathing of fumes. Also, they are somewhat more difficult to filter and generally present housekeeping problems compared to water-based fluids. More important is the fact that satisfactory operation can generally be obtained on many jobs with water-based fluids. They provide satisfactory cooling, good corrosion protection, and are easier to handle in most situations than oil. The wide use of water-based fluids for most grinding operations indicates that the compromise appears to be satisfactory. However, based on the laboratory results described above, it is highly likely that the use of a grinding oil in any given operation will give improved performance compared to the water-based fluids generally used.

A convenient way to illustrate some of the points discussed above is to consider several specific and somewhat different types of grinding

Effect of Grinding Fluid on Residual Stresses

Fluid	Maximum Tensile Stress, psi
Dry	92,000
Emulsion	90,000
Oil	60,000

Table 4

Surface Grinding Titanium
(60-grit carbide wheel)

Fluid	Grinding Ratio (G)*
Oil A	8.5
Oil B	17
Synthetic Water-Based	2

*Ratio of metal removed/wheel wear

TABLE 5

operations. Abrasive cutting is essentially grinding with a thin wheel that acts much like a saw blade. When this operation is done with no fluid, as is not unusual, no chips are formed. The debris remaining after the operation is in the form of globs of solidified metal, indicating that the workpiece was melted rather than cut. When water-based fluids are used, actual chips are formed and longer wheel life, a cleaner wheel, and a more accurate cut is obtained.

The belt grinding of sheets of metal, particularly stainless steel, is a growing technique for commercial finishing. EP grinding oils have been found to give better results (longer belt life), compared to water-based fluids (4). The water fluids appear to be satisfactory for grinding soft metals, plastics, and glass where they are effective in keeping the dust down. Where lubrication is desirable such as in grinding stainless or alloy steels, rich emulsions have an advantage because of the lubrication properties they have, compared to the solution fluids or lean soluble oil emulsions usually used in conventional grinding operations. When a particularly fine finish is desired in belt grinding, wax or grease is sometimes used on the belt. They act as fillers to reduce the effective grain size and therefore give a smoother surface finish.

The grinding of titanium is a problem that has received considerable attention and is now commercially feasible as a result of the work done on grinding fluids. Here again, grinding oils are preferred, particularly when grinding with carbide

Belt Grinding Titanium

Fluid	Relative Volume Removed (C)*
Dry	1.8
Water	2.3
Emulsion (4/1)	16
Grinding Oil	61
14.5% Potassium Phosphate Solution	97

*Comparable to G ratio for wheel grinding

TABLE 6

wheels at the conventional speeds of 4,000-6,000 surface feet per minute (5). The data in Table 5 show that Oil A gave double the wheel wear obtained with Oil B, although both were far superior to the water-based fluid tested (6). With this rather unique metal, laboratory research, as well as field experience, has indicated that a 15% water solution of potassium phosphate will give up to 50 times longer belt life than can be obtained with dry grinding (7). Results with water, a conventional emulsion, and a grinding oil fall between these extremes, as indicated in Table 6. The potassium phosphate solution is rather caustic; it is an effective paint remover, and obviously requires special shop precautions. Nevertheless, the better belt life and higher metal removal rates usually justify the use of this type of fluid. This is a good example of the kind of improvement that can be made in metalworking operations as a result of research on the problem.

SUMMARY OF CONCLUSIONS ON GRINDING FLUIDS

In nearly all operations, grinding oils containing extreme pressure lubricants will give lower wheel wear, better surface finish, lower energy requirements, and leave lower residual stresses in the metal compared to water-based fluids. Water-based fluids are often satisfactory for many jobs where the problems associated with oils prevent their use. Perhaps the best compromise for many situations is to use an EP soluble oil containing an effective lubricating agent. This type of fluid can provide both the cooling of the water-based fluids and the lubrication of the grinding oils. It is interesting to note that this is the same conclusion that was reached with metal cutting—that is, an EP soluble oil is the preferred fluid for most operations.

The result obtained in any grinding operation comes directly from the combined skills of the abrasive manufacturer, the grinding machine builder, the lubricant supplier, and the machine operator. Only by cooperation between all of these groups, as well as the designer of the part to be fabricated, can success be achieved. Closer and better cooperation is essential, both in the shop and in the research laboratory, if the battle to lower metalworking costs in the face of ever growing competition is to be won. • • •

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Dressing Time Reduced to Eight Hundredths of a Minute

Automatic dressing of internal grinding wheels has reduced dressing time while maintaining the accuracy of grinding wrist and crank pin bores of small connecting rods at Evinrude Motors.

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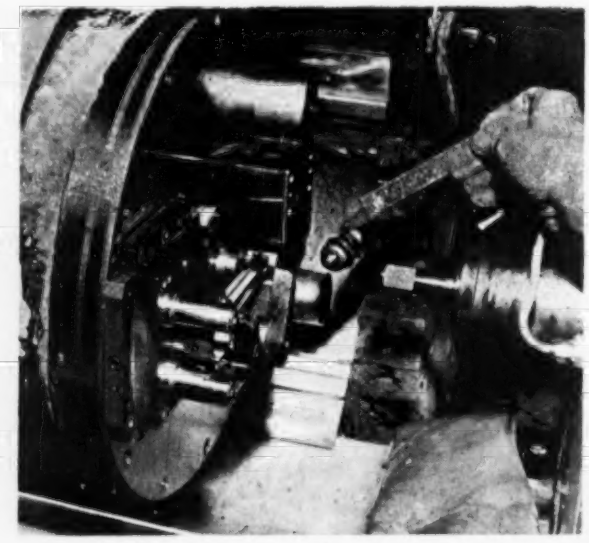
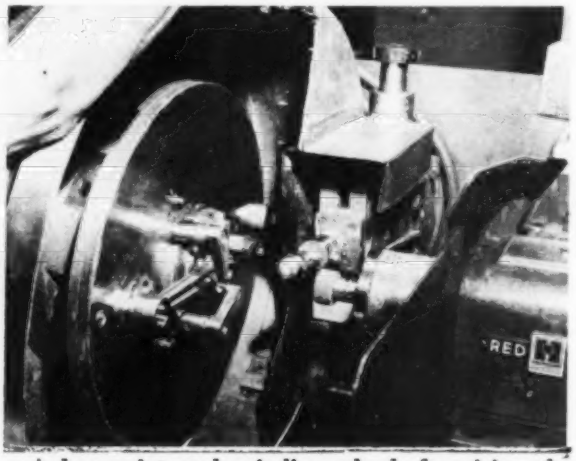


The rigid dimensional and surface finish requirements for the piston wrist pin bore of connecting rods used in Evinrude outboard motors are met by dressing the internal grinding wheel between its rough and finish sizing strokes. The single-point diamond tool (center) automatically makes two passes across the grinding wheel face as it withdraws from the rough ground bore. The freshly dressed wheel then makes the finish sizing strokes. The grinding operation (cover raised for the photograph) is cooled by a heavy flow of oil and water mixture.

The bores of the connecting rods are ground by No. 271 fully automatic Heald internal grinders, located back to back, allowing one man to operate both the grinder for the wrist pin bore and the grinder for the crank pin bore.

Specifications for the wrist pin bore require a diameter of .875 inches, plus .0000 or minus .0005 inch. An eight micro-inch (maximum) finish is specified for the surface of the wrist pin bore. The grinding and dressing sequence is as follows: (1) An internal grinding wheel (19A80-L6VBE) rough grinds the wrist pin bore and withdraws. This portion of the operation required .27 of a minute. (2) A single point diamond dressing tool with .033



A larger internal grinding wheel, for sizing the inside diameter of the connecting rod crank pin bore, is dressed by a diamond tool between the rough and finish grind of bore. The dressing of the wheel between rough and finish grinding is required to meet the specifications for this precision part. The crank pin bore is also honed after it is finish ground.

carat shaped diamond point automatically dresses the face of the wheel twice. Total lapsed time for dressing is .08 of a minute; this is the time it takes the wheel to withdraw and feed past the stationary diamond dressing tool. (3) Then the freshly dressed wheel moves into the bore again for the finish sizing strokes. The required time for finishing is only .25 of a minute.

The wheel speed for the grinding of the wrist pin bore is 27000 r.p.m. About .0075 inch of stock is removed from the radius of the bore during the grinding operation.

In grinding the crank pin bore, the connecting rod is transferred to another internal grinder where the bore is sized to 1.4997 inches diameter, plus or minus .0002 inch, with 15 to 25 micro-inch surface finish. The internal grinding wheel (GA60-K6-V10) is also dressed automatically between the rough and finish grinding with a .033 carat single-point diamond. Wheel speed is 17,500 r.p.m.

Times of this operation are the same as for the wrist pin bore. Total time of each operation floor to floor is .87 of a minute. Production rate for both bores is 55 per hour. One machine grinding one bore size enables a man to finish 460 rods per day or 800 to 840 rods per day on two machines.

Because of rigid surface requirements the crank pin bore is honed after the grinding operation.

• • •

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Precision Crankshaft Service, Inc., specializes in the re-building of crankshafts and camshafts ranging in size from large diesel-engine types to small farm tractor sizes. The company services motor re-builders and automotive jobbers within the five-state Great Lakes Area. In addition, to its job work, the company carries a large inventory of rebuilt parts. It also performs special "stroking" work on racing engine cranks—cutting down on journal sizes to lengthen the piston stroke for higher compression ratios.

The crankshaft finishing operation consists of sanding the journals to the required finish after repairing, straightening and rough grinding. Using a Storm Vulcan KOTAFIN grinder, the shafts are mounted between centers and rotated. A special spring-loaded adapter plate on the driving-head facilitates loading different length shafts. The operator begins the finishing operation on the outer-most journal, and works forward until all journals are finished. Upon completing the pass, journals are inspected and given a rust-resistant coating.

Production rate averages 10 crankshafts per hour. The resin belt travels at a speed of approximately 11,000 surface-feet per minute. Belts are replaced after finishing five crankshafts, although they still retain useful cutting life. This practice, the company maintains, allows producing uniform finishes without necessitating extra passes. • • •

A Storm Vulcan KOTAFIN grinder and Michigan Abrasive Company Red Coat Resin No. 8/0-280 grit aluminum oxide belt enables Precision Crankshaft Service, Inc. to polish various size crankshafts to a 5-6 microfinish at an average production rate of 10 per hour.

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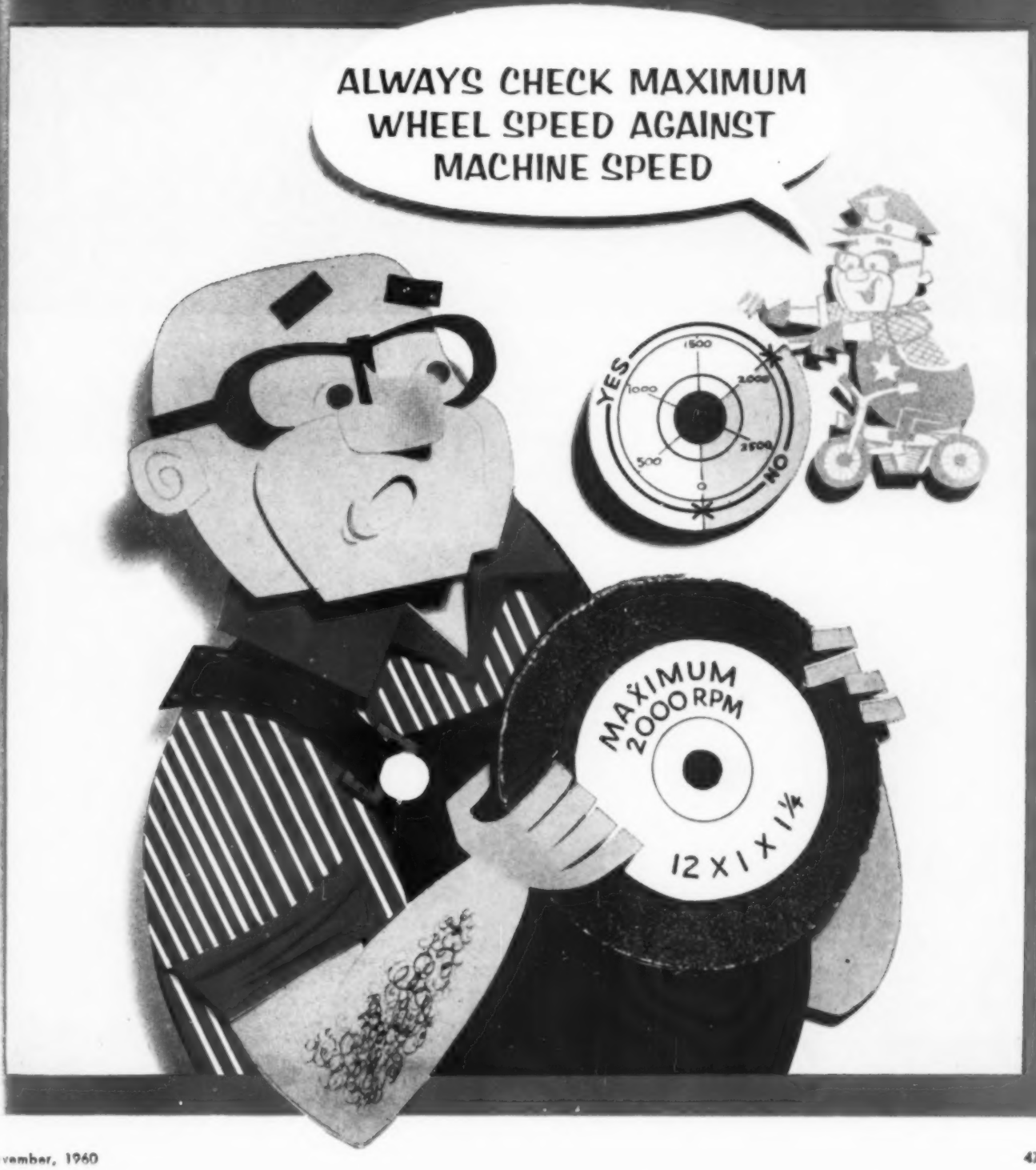


The operator at right is checking thickness (and flatness) readings from the X-ray gauge between the two machines. Normally, the work travels from right to left.

A Breakthrough for Stainless Producers

Wallingford Steel has made a major break through in production of stainless steel. Through the purchase and installation of a wide-belt, oil grinding process developed by Behr-Manning, they are now able to successfully grind the crown while reducing the belt usage from 4½ belts to one, increase capacity almost four times and save over $91,000 annually.

By **M. M. PATTERSON**
Managing Editor

● Wallingford Steel Company is now operating the most modern wide-belt grinding line in the world. This line, while saving nearly two-thirds of the previous grinding costs, grinds as much as .006" per pass to 3-4 rms and holds ±.00015" on stainless steel coils. Of primary importance is the control of the crown and this is now being held to 3%. (On .001 gage, this is 30 millionths of an inch.)

The investigation by Wallingford Steel which lead to the development and purchase of this new line was originated in order to effect a cost reduction, increase grinding capacity and produce stainless steel to "machined quality" for their customers. At the time of the investigation, Wallingford was using a 2-headed dry grinder and a 3-headed finishing grinder. These machines produced approximately 135,000 lineal feet per month working the dry grinders 3 shifts per day and the finisher one shift. Working the dry grinder at maximum production, high grinding and maintenance costs plus the need for closer crown grinding thus became the objects of the investigation.

Solution of the investigation actually started with studies by the Behr-Manning Product Engi-

neering staff some eight years ago. These studies developed the oil grinding process which meant so much to the present line. As early as 1956, savings were predicted as high as $10,900 per month for grinding belts and machine hours. In 1959, both stock removal and grinding the crown as well as finish were found to be acceptable to Wallingford management.

In addition, study of present economies revealed an estimated direct labor and belt savings of $91,000 annually, increased capacity—a ten coil order could be finished in 12 hours instead of the present 65 hours, and some of the equipment now in use could be used in lieu of buying new equipment on other projects. Now, in 1960 the decision to buy and install the new line was made for three reasons: Ability to "grind for crown" provided a process which would produce a machined quality strip; economy of operation would provide a return on the investment in approximately 2½ years; grinding capacity would increase from a maximum of 392 tons per month to a potential of 1500 tons per month. Still another savings comes from the ability to salvage entire coils which formerly were sent back to the mill for re-melting.

EQUIPMENT AND PROCEDURES

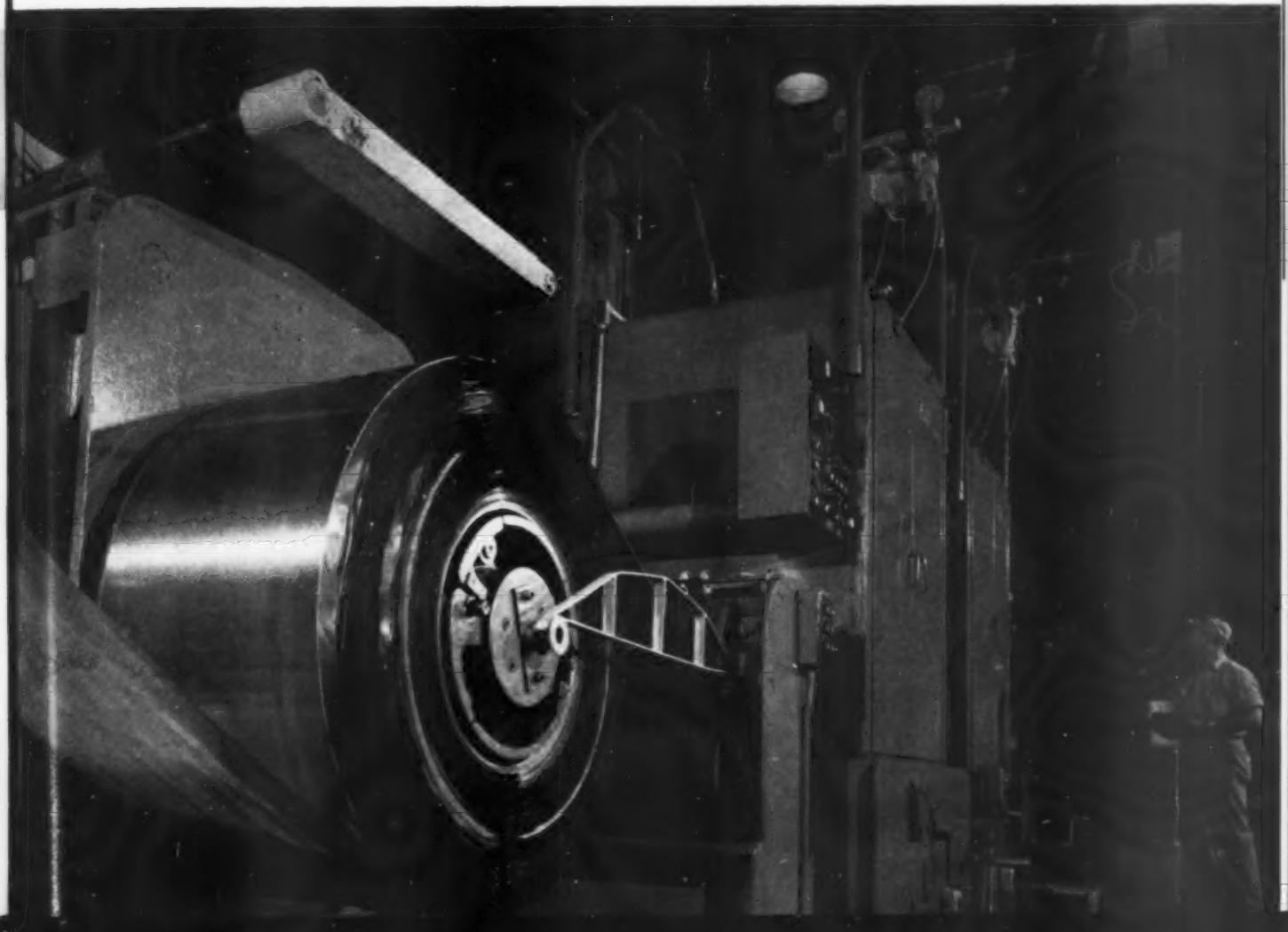
The basic machines which constitute the grinding line are two Hill Acme "30" wide belt 60 hp oil grinders. These machines are typical 2-roll vertical belt strip machines with features such as idler rolls mounted on adjustable way design for correct 20 degree angle of break and with sufficient rigidity for the 30,000 lbs. tension held on the first roll. Other features included in the line are provisions for a maximum of 100 gallons of coolant per minute to be delivered to the heads from 5,000 gallon reservoir and Delpark filtration system. A steel billy roll supports the strip against the belt by hydraulic pressure. An overhead power hoist is mounted on top of each machine which, with a canvas sling, eases roll changes. Extensive gaging and charting equipment is also provided for pregaging and recording of each coil.

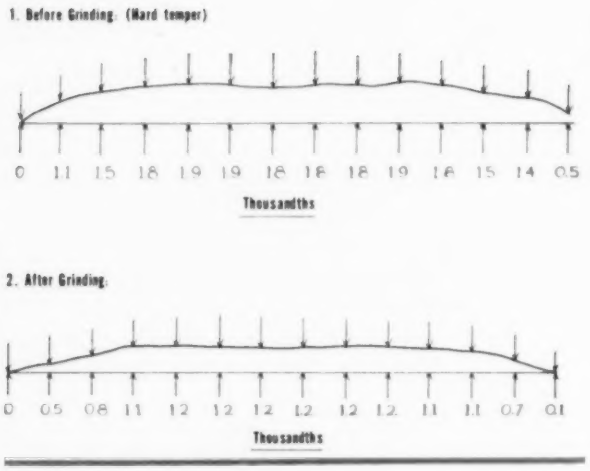
Belt specification depends upon the job requirements; however, generally speaking, aluminum oxide is used for stock removal while silicon carbide is used for finish. Both are all-resin bond belts as glue bonds were found good only for less aggressive finishing operations. Grit sizes used most are 60 and 80. Sizes 100 and up are used for finishing only. All belts are cloth back.

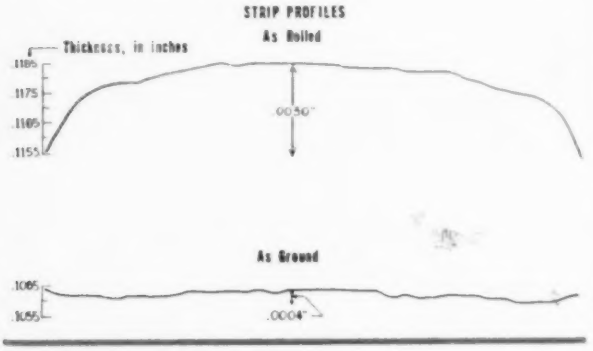
Coolant is a sulfur-chlorinated oil which is presented to the work and belt of each grinding head at 65 gallons per minute. For finishing this 190 sps oil has been cut by lighter oil and is used in a spray to reduce the hydraulic cushioning of oil.

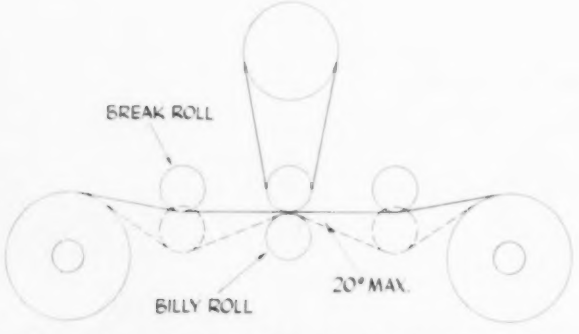
Speeds and feeds on this line reveal some of the original thinking which has made this operation a success. The contact rolls operate at 900 and 1800 rpm which gives a belt speed of 2100 or 4200 sfpm. The work is fed to the belt at speeds between 5 and

The new wide-belt oil grinding line viewed from what is normally the takedown or output end. Protective paper is fed to the coil from the extreme left. Weight of a single coil often exceeds five tons. Maximum width of strip ground at Wallingford Steel Co. is 27 in.




1. Before Grinding. (Hard temper)
0 1.1 1.5 1.8 1.9 1.9 1.8 1.8 1.8 1.9 1.8 1.5 1.4 0.5
Thousandths
2. After Grinding.
0 0.5 0.8 1.1 1.2 1.2 1.2 1.2 1.2 1.2 1.1 1.1 0.7 0.1
Thousandths
1. Before Grinding. (Soft temper)
0 0.7 0.9 1.0 0.8 1.4 1.5 1.0 1.0 0.8 0.8 1.0 1.0 0.3
Thousandths
2. After Grinding.
0 0.3 0.3 0.3 0.3 0.4 0.3 0.3 0.2 0.4 0.3 0.3 0.3 0.2
Thousandths





This schematic shows how the break rolls flatten the strip as it approaches and leaves the grinding point, defeating its tendency, developed earlier in rolling, to curl or bow. The break rolls are positioned positively by manual screw-thread adjustment. The contact roll (immediately above the billy roll) may be of knurled steel for tolerance grinding or serrated rubber for stock removal and finishing.

36 fpm. The feed rate depends upon the required depth of cut, type of stock and surface finish required.

The belt speed of 2100 sfpm is believed to be the first time this speed has been used. This has resulted from the tests by the Behr-Manning Product Engineering Department. These tests which were on the oil type grinding as performed at Wallingford have proved that the lower speeds with heavy oil flood increase belt life, increase stock removal and provide greater precision.

Rolls also play a large part in the success of this line. Contact rolls are knurled steel or serrated rubber, in a range from 45 to 90 durometer, dynamically balanced. The billy roll is solid steel 8" in diameter. For accuracy and grinding the crown, contact and billy rolls are set parallel using feeler gages.

TUBE MILL STOCK

One example of the results obtained by Wallingford Steel on this new grinding line is the corrective grinding of tube mill stock. In this particular example, the material is in the hard condition. The operation prior to grinding is a rolling operation. The material is type 302 stainless steel which is ground to .140" thick or 78% of the starting gage. This type of grinding is considered corrective, with the conditions of the coils having heavy roll marks, light slivers and rolled in paper. For the grinding operation, the No. 1 head uses a 90 durometer 45 deg. serration ⅜" land by ⅜" groove contact roll on both heads. Belt speed for the No. 1 head is 2100 sfpm and for the No. 2 head, 4200 sfpm. Belts for this operation are 80 grit aluminum oxide, resin bonded, cloth back. The belt on the second head is used (approximately 600 ft). The strip speed of the coil is 18′ to 20′ per minute. Contact pressure on the first head is started at 40% load progressively increasing to 55% load at the end of the pass. On the second head, it is started at 50% with progressive increases to 55% load at the end of the pass. The strip tension on the take-up reel is held between 65 to 75 amps. One pass is made on each side with an average stock removal per pass of .0011" with an average finish of 20 rmps.

It was noted in this operation that increase in surface speed from 18 to 20 fpm decreased the stock removal by approximately 12.25%. It was also noted that the use of two used belts decreased stock removal and the required increase in grinding pressures resulted in severe edge taper. A second test performed at Wallingford Steel was on the same material with one difference—this being that steel was passed through on the annealing line prior to the corrective grinding. The condition of the coil, thus, was presented to the grinding line with light pits, slivers and hot roll seams. All the conditions of the grinding operation were the same as for the hard steel with the exception of the contact pressure which was started at 40% load progressing to 50% load on the No. 1

head and starting at 45% load, increasing to 50% load on the No. 2 head. Tension on the take up reel was held between 50 and 75 amps with the same number of passes providing an increased average stock removal to .0015" and an increase on this reading of 35.

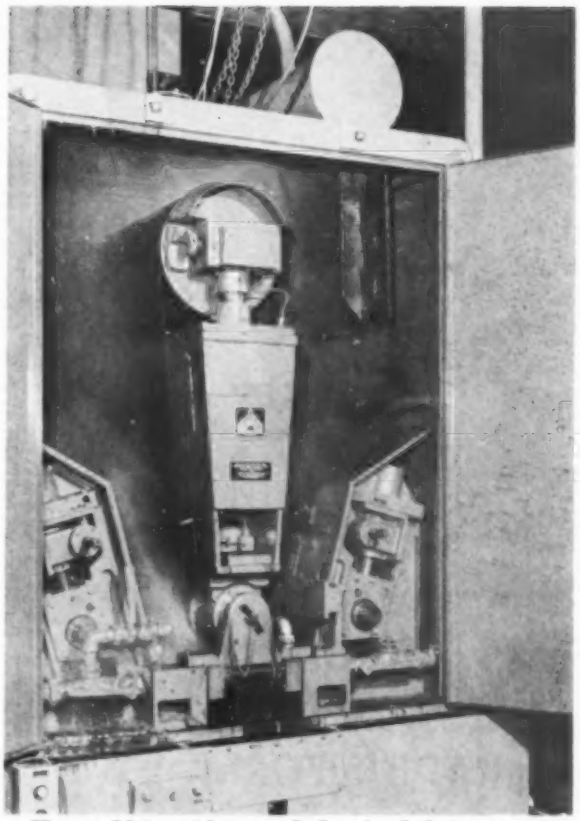
The most unique difference between the hard and soft steel coils was that approximately 40% more stock was removed from grinding the soft as opposed to the hard and the crown was decreased by 2/3 in the soft state as compared to 1/3 in the hard state. Also noted was that a 65 durometer contact roll for heavy stock removal caused excessive edge taper. On the other hand, belt grits of a 60 to 80 sequence removed approximately 9% more stock than the 80 to 80 sequence. It can therefore be concluded that the 80 to 80 sequence is the most advantageous sequence as it provides a finish 15 micro inches less than the 60-80 sequence while also providing healing characteristics which offset the advantages of the second sequence.

In comparing the new method to the old method of dry grinding tube mill stock, it is disclosed that the passes per side were reduced from 3 passes to 1 or a 300% improvement. Belts consumed per side were reduced from 4.5 to one or a 450% improvement while processing time including coil handling and pass time reduced from 134 minutes to 63 minutes or a 213% improvement. It should also be noted that the oil grinding method has imparted a better finish with complete removal of imperfections.

A second application reported by Wallingford Steel was the crown removal which obtained machined quality strip. In this operation, the material was 301 stainless steel in the soft state. Condition of coil is described as heavy scale, which necessitated two extra passes, one on the top and one on the bottom. The crown as presented to the grinder was .0003", the suggested sequence. On this material, three passes would be made with all heads using knurled steel contact rolls running at a belt speed of 4200 sfpm. The first pass by the first head would use an 80 grit aluminum oxide belt with pressure loads of 40 to 55%. 60 amps would be held throughout for strip tension as well as the strip speed of 6" per minute. The second head on the first pass would use a 100 grit silicon carbide with belt pressure loads running between 40 and 45%. The first head on the second pass would use a 100 grit silicon carbide belt running at a pressure load of 40%. The remaining passes would use 120 grit silicon carbide belts with the second pass second head running at 35 to 40% load. Both heads on the third pass would run at 30-35%.

From the drawings included with this article, it is quite apparent that the grinding of the crown has been accomplished by this new line and of equal importance are the tremendous savings introduced by the application of wet-belt grinding.

• • •



Here a 30-in. wide coated abrasive belt is removing crown at a surface speed of 4200 ft per minute, using a knurled steel contact roll. Oil floods each grinding head at the rate of 65 gallons per minute.

Thickness of the strip is gauged by X-ray at several points across its width. The recording unit above the strip operates a tracer stylus in a console remote from the grinders. The polished rod at left center is the hydraulic piston rod which traverses the gauge automatically.

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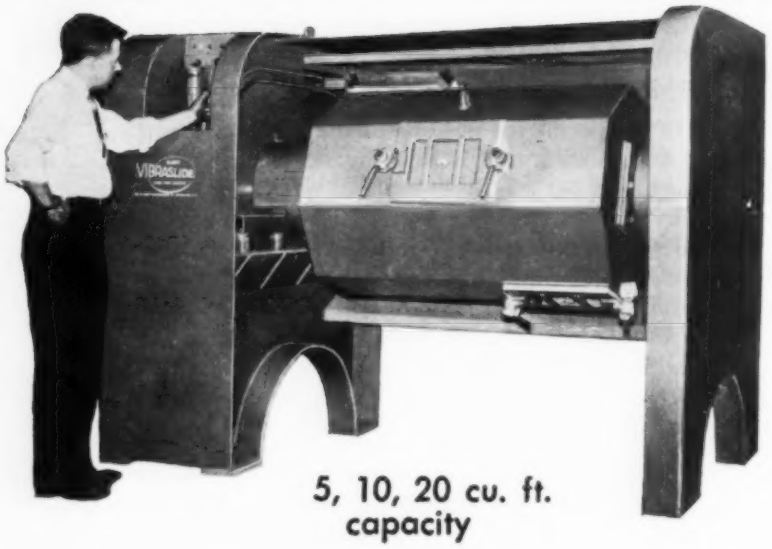

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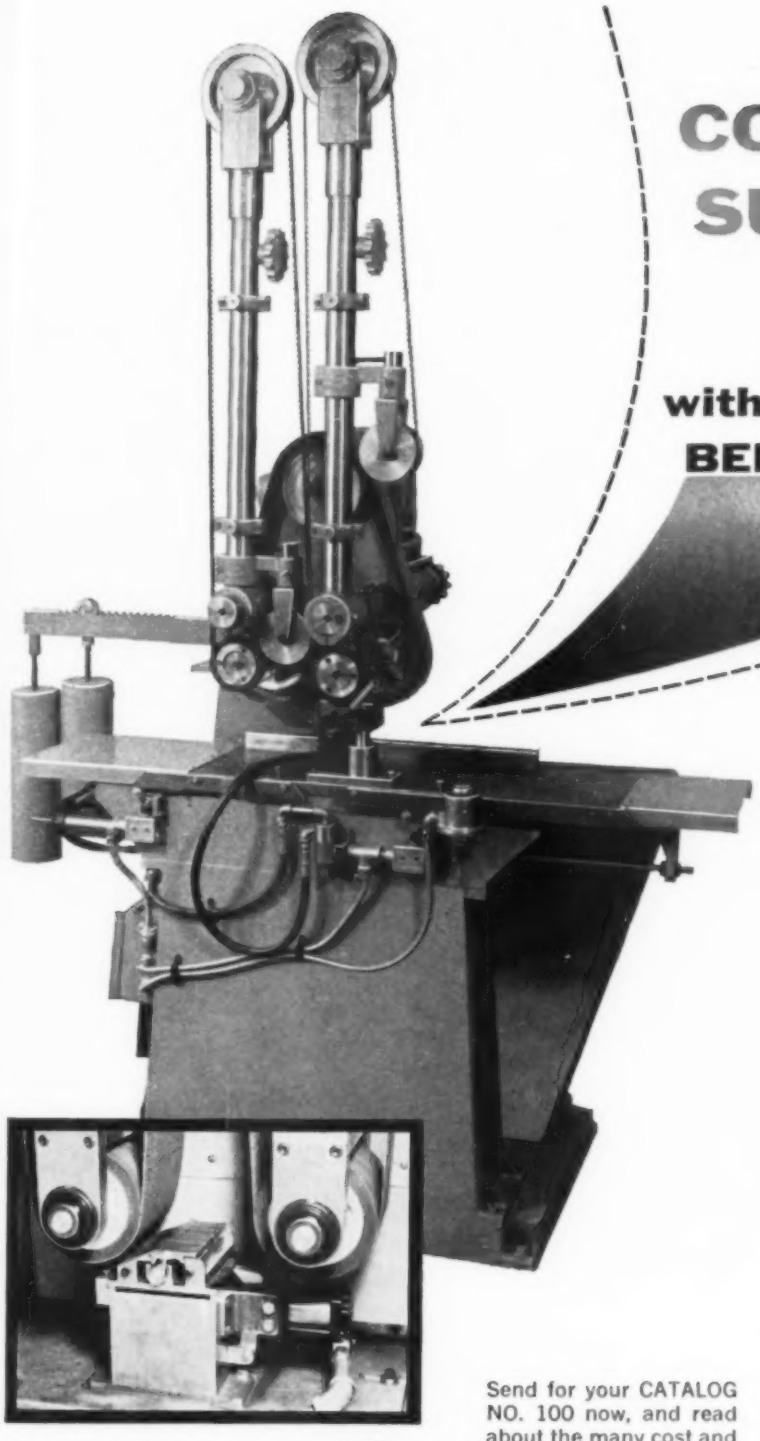

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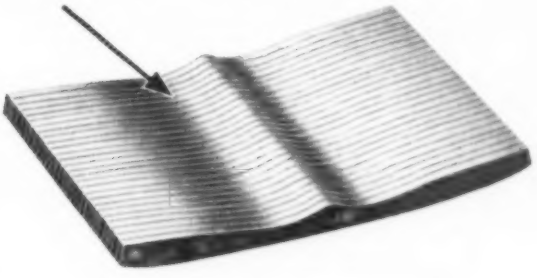
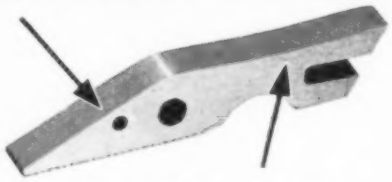
Now, complete control of stock removal, surface finish, and forms or contours is possible on many complex shapes.



Send for your CATALOG NO. 100 now, and read about the many cost and production savings.



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13 JAWS of hand pliers get their top form ground and finished automatically in one operation . . . in a matter of seconds on a LOUNGWAY double-spindle machine. The sides of the jaws are surface ground in a single-spindle grinder 32 sides at a time and held to 0.005" on thickness.

JACK KNIFE SPRINGS

Jack knife spring production increased five times. 28 springs are preloaded into fixture . . . rough ground and finished at the rate of 2,500 per hour. Hand grinding over this irregular form previously produced only 500 pieces per hour.

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June 3, 1960

Mr. C. R. Stroupe
Vice President
ANOCUT ENGINEERING COMPANY
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Chicago 6, Illinois

Dear Mr. Stroupe:

We are pleased to report that The Timken Roller Bearing Company now has a total of nine Anocut units in operation in the Canton, Columbus, and Bucyrus Divisions.

Seven of these are 300 and two are 600 ampere units. The seven 300 ampere units are used on 6" x 18" Norton Surface Grinders for chip breaker grinding operations. Three of these units are in a dual setup whereby a switch kit is used to switch the Anocut unit to a Porter-McLeod Cut-Off Machine. These cut-off machines are used to salvage chipped tools and cut carbide to special lengths.

The two 600 ampere units are used on Hammond SCE-10 dual table oscillating grinders. On these latter machines, we are, for example, removing .045" of solid carbide in 45 sec. from a tool approximately ½" square, processing two tools simultaneously.

We are realizing a savings of 7 to 1 in diamond tool costs, and a reduction in grinding time of approximately 4 to 1.

C. A. Laase
Mechanical Engineering Department

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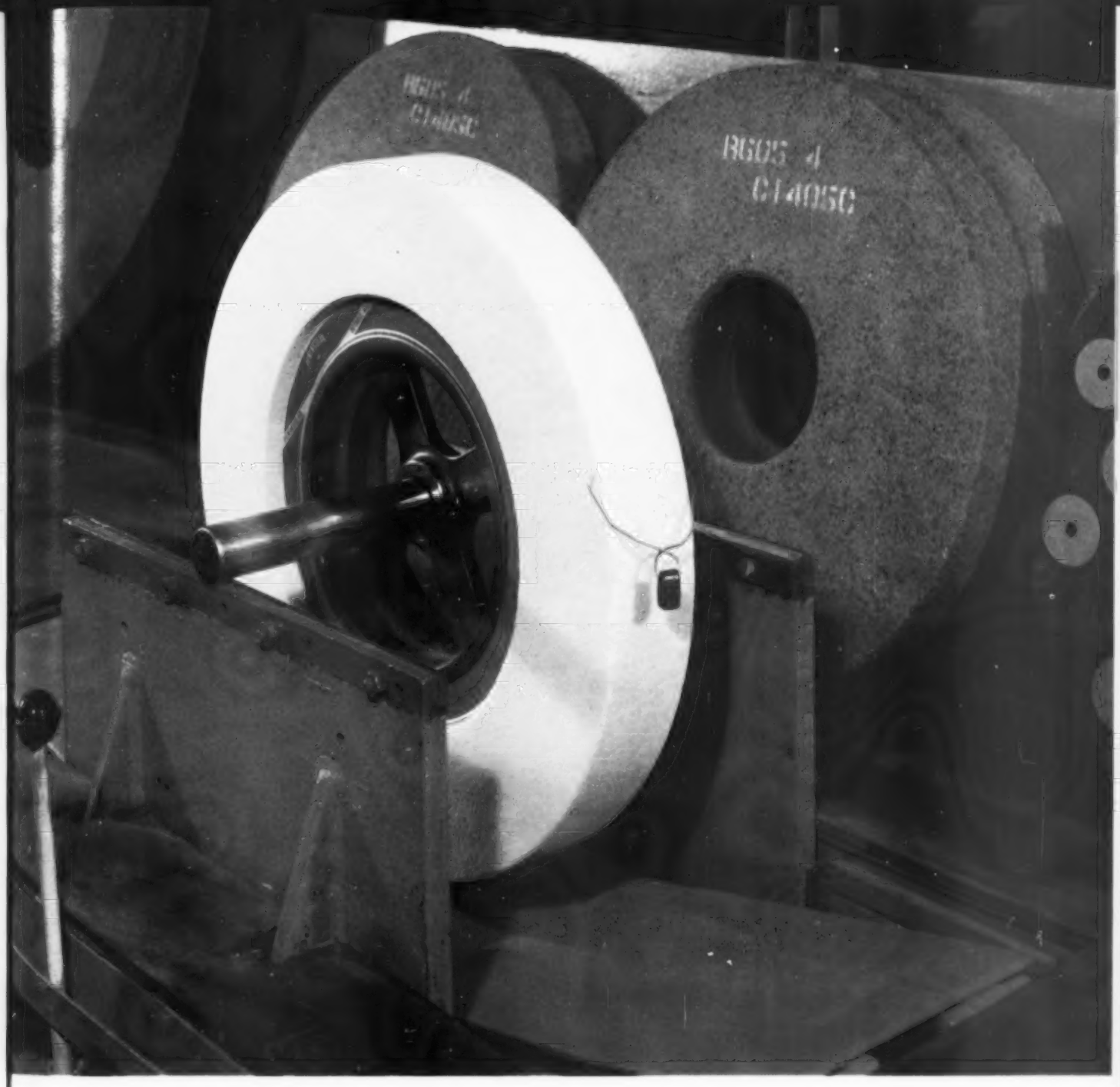

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Every Peninsular wheel must pass the most rigid test for balance to insure freedom from vibration and smooth operation. Out-of-balance allowance may be less than 1/1000th of wheel weight, as little as one gram—depending on recommended wheel application.

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80% on power cost.

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How U.S. Steel Selects Wheels for Maximum Efficiency

● The expenditure of thousands of dollars per month for grinding wheels is more than sufficient reason to develop a standard test form. In order to fit all occasions, the form must present standard questions to cover all areas of the test and allow for expression of the individual testing.

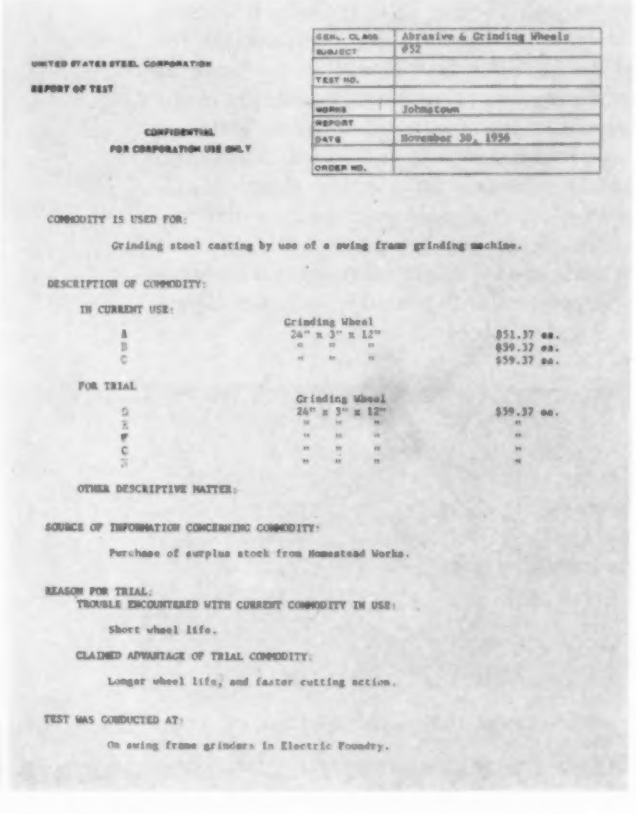
These requirements are the prelude to the development of United States Steel Corporation's form for grinding wheel tests. The form which they have developed consists of two pages. The front page covers use, description of the material being tested, reason for testing and location of test. The second page covers procedure, observations, comparison of performance, economics and conclusions. These very broad headings provide the latitude necessary to cover all areas without restricting the tester and without requiring a large number of specific forms.

After a test has been given approval by the supervisors at the plant immediately involved, it is conducted and the results are then sent to the main offices of the corporation. Copies are made of the original results in the main headquarters. These copies are then routed to all purchasing agents and additional personnel of all plants and departments of the corporation who may in any way be interested or able to use the results.

The first heading of the form sets the stage of the test. The title used by U. S. Steel in their form is "Commodity is used for." Under this heading is described the operation in which the abrasive is used.

The second heading, "Description of commodity", lists all the abrasives to be tested. This listing includes specifications, sizes, prices and any additional material which may be important to the test evaluation. The material is broken down into two groups. These are sub-titled, "In current use" and "For trial." Still another subtitle is headed, "Other descriptive matter", which becomes a catch-all for information not covered above.

The third heading, "Source of information concerning commodity", is merely for background material. The fourth heading is, "Reason for trial." Under this heading are two sub-heads which really get down to the heart of the trial. These sub-heads are, "Trouble encountered with current commodity in use" and "Claimed ad-



UNITED STATES STEEL CORPORATION

REPORT OF TEST

CONFIDENTIAL
FOR CORPORATION USE ONLY

GEN'L. CLASS	Abrasive & Grinding Wheels
SUBJECT	#52
TEST NO.	
WORKS	Johnstown
REPORT	
DATE	November 30, 1936
ORDER NO.	

COMMODITY IS USED FOR:

Grinding steel casting by use of a swing frame grinding machine.

DESCRIPTION OF COMMODITY:

IN CURRENT USE:

	Grinding Wheel	
A	24" x 3" x 12"	$51.37 ea.
B	" " "	$39.37 ea.
C	" " "	$59.37 ea.

FOR TRIAL

	Grinding Wheel	
G	24" x 3" x 12"	$59.37 ea.
K	" " "	"
F	" " "	"
C	" " "	"
J	" " "	"

OTHER DESCRIPTIVE MATTER:

SOURCE OF INFORMATION CONCERNING COMMODITY:

Purchase of surplus stock from Homestead Works.

REASON FOR TRIAL:
TROUBLE ENCOUNTERED WITH CURRENT COMMODITY IN USE:

Short wheel life.

CLAIMED ADVANTAGE OF TRIAL COMMODITY:

Longer wheel life, and faster cutting action.

TEST WAS CONDUCTED AT:

On swing frame grinders in Electric Foundry.

- 2 -

TEST PROCEDURE:

Grinding wheels sized 24" x 3" x 12" are used to finish grind rough steel casting in the Electric Steel Foundry. During this test calendar months were assigned for testing wheels produced by various manufacturers. Accurate records were maintained and evaluated of wheel consumption and cost, man-hour expended, departmental charging rate per man-hour and tons of finished steel castings produced.

OBSERVATIONS MADE DURING TRIAL:

Periodic observations of wheel cutting ability, wheel life etc. were made during each testing period and these observations were found to be in agreement with the evaluations listed below.

COMPARISON OF PERFORMANCE, LIFE, SAFETY, ETC.:

After evaluation of all factors detailed in Par. #13 the results obtained by testing the grinding wheels was as follows:

ORDER NO.	DATED	MANUFACTURER	WHEEL SPEC.	PROD. FINISHING COST PER TON
17622	9/29/5	A	A-126-M6	18.32
23296	9/20/5	M	A-141-P4	18.62
18869	12/5/5	B	A-14-P5	18.87
20787	4/4/5	C	A-124P	19.15
20377	3/24/5	F	A-123-PB11	19.37
18243	10/31/5	G	A14-0-8B21	19.65
19869	3/16/5	K	A-12b-F7	19.66
18092	10/25/5	D	A-144-Q-7	20.61

ECONOMIC COMPARISON OF COMMODITY:

CONCLUSIONS AND RECOMMENDATION:

Manufacturers supplying wheels developing the lowest cost per ton of finished castings produced are A, M, and B therefore wheels ordered in the future for this operation will be of their manufacture.

APPROVAL:

Reported by:	Foreman, Cleaning Room	11/23/5
Works:	Supt., Elec. Fdry.	11/23/5
	Genl. Supv., Stores	11/23/5
Company	Buyer, Purchasing Div.	11/28/5

vantage of trial commodity." These, you will note, are the basic reasons for any test.

"Test was conducted at", is the last heading on the first page and is again only for background information.

The first section of the second page is entitled, "Test procedure." This area not only covers the conditions in detail but also includes a description of the records which were kept in order to arrive at the comparisons, economics and conclusions.

The next heading is, "Observations made during trial." This section along with the heading, "Conclusions and recommendations", allows for personal expression which is so important in any test. Facts alone can be misleading if they are evaluated without allowing room for expression of factors of the test which can not be expressed with figures.

The third heading on the second page is entitled, "Comparison of performance, life, safety, etc.". This section is provided for the summation of all the facts which have been gathered during the test. In our example, the concluding facts were production finishing costs per ton. An additional title follows for economic comparison which was not used in this case.

The final heading is, "Approval." This follows the conclusions and recommendations described earlier. • • •

Automatic Flap-Wheel Sheet Edging Saves Maintenance

● A new automatic method of grinding edges of flat sheets for resistance seam welding has been developed by National Electric Welding Machines Co., Bay City Mich., cooperating with engineers of Inland Steel Container Co.

The developers say the method eliminates wheel dressing and readjustment of the grinding device while reducing replacement frequency.

Installed on an automatic container line built by National Electric for Inland, the new method uses a Minnesota Mining & Manufacturing Co. "PG" coated abrasive wheel to clean the edges of either hot or cold-rolled sheets.

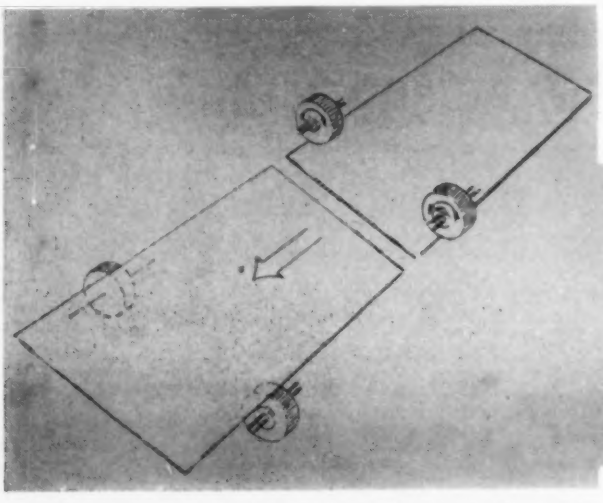
Application of the multi-paddled wheel eliminates the constant maintenance that marks the two most common alternate methods of preparing sheet edges for resistance welding: conventional grinding or shot blasting.

National Electric engineers report the flexible cloth wheel easily cleans hills and valleys in the edges which would be ground thin or missed completely by a conventional wheel.

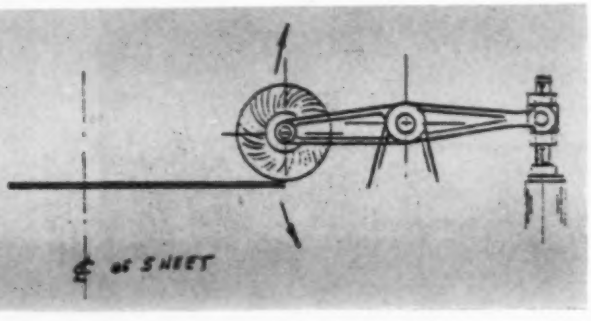
A self-regulating force inherent in the wheel permits constant spindle speed as the abrasive segments wear. The engineers discovered that as wear occurs, the shorter paddles produce the same grinding effect as a fresh wheel at the same drive speed.

Controls developed by National Electric to adapt the wheel to the line include a timing mechanism which automatically compensates for wear and brings the wheel closer to the work at a predetermined rate. Another mechanism raises the wheel while the sheets advance to grinding position to avoid damage to the wheel. Automatic adjustment is provided for varying sheet length.

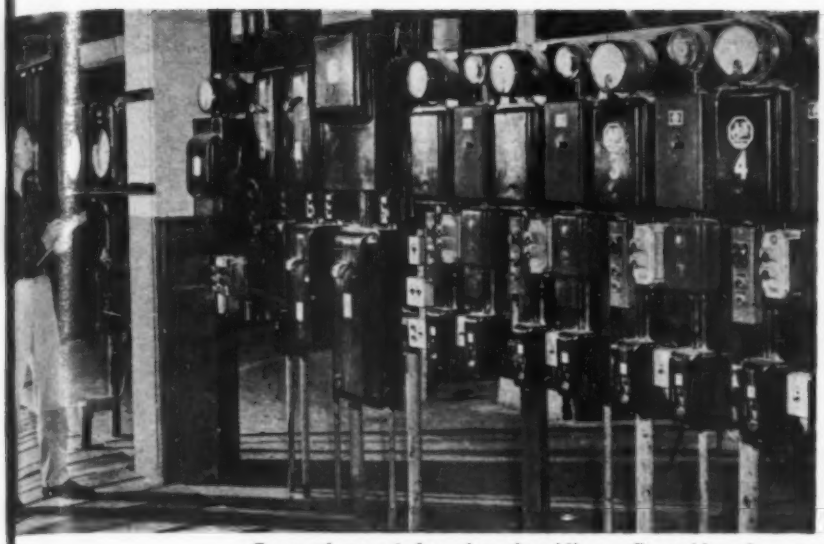
Two pairs of wheels—one each for top and underside of the edges—are mounted at the grinding station. Wheels are adjustable through a 30-degree arc from perpendicular to provide maximum cleaning under varying job conditions. • • •



Placement of flap-type wheels, sheet spacing, and direction of work flow are shown in this sketch. Two wheels are above sheet, and two below.



Rocker arrangement that permits lifting of wheel as sheet moves into work position and provides downward adjustment to compensate for wheel wear.



Control panel for the classifiers. Centrifugal sorting is faster, more accurate than flotation.

Close-up of a centrifugal classifier used for rapid, accurate sorting of corundum powders.

How More Accurate Sizing Improves Corundum Quality

Corundum, a natural aluminum oxide, maintains a limited but consistent area of use, mainly in the surfacing of glass. Better sorting of corundum powders improves performance.

By L. P. DUMAS
Material Control Superintendent
American Optical Company

● The rapid rise of manufactured abrasives over the past few decades has tended to obscure the role of natural abrasives like corundum in the American industrial scene. Against the hundreds of thousands of tons of manufactured aluminum oxide and silicon carbide used per year, the few thousand tons of corundum does not loom very large.

Yet there is, in the optical and glass component grinding fields and in a number of metal finishing and lapping applications, a sort of "hard core" of corundum users. For these, corundum has withstood the inroads of synthetic abrasives, and seems likely to continue to do so.

Corundum is a naturally-occurring aluminum oxide, second mineral to the diamond on Mohs' scale of hardness, which is now mined chiefly in southern Rhodesia and South Africa. In the latter part of the nineteenth century it was a major ingredient of grinding wheels. Its usage in the United States has been about 2% of the total abrasive market for some years, and it seems likely to remain at least in that range until there is a significant reverse in attitude on the part of its

continued

continued

present users, or a significant increase in its price relative to its competitors.

This is probable in spite of the fact that corundum, as a natural product, is subject to variations in quality. Not all corundum is suitable for abrasive uses. A plus quality of the abrasive grade, however, is that it breaks down gradually and continuously during use, so that sharp particles are progressively produced. Corundum is always hexagonal in shape, with six cutting edges. As the particles break down, each piece still has six edges. There is no slivering, which is a major problem in glass surfacing.

Another factor in its favor is that its users have developed specialized equipment and techniques to such an extent that a shift to other abrasives would require fundamental changes in processing, and expensive and different equipment.

Since corundum is a natural abrasive, its processing is primarily a matter of crushing and sizing. For the larger grit sizes this is a standard operation, presenting few problems. For the 25-micron and under powder required by the optical trade, one of the largest users, accurate sizing is imperative. One oversize grain could very quickly ruin a piece of optical glass.

For many years this grading was done by the slow and costly flotation process, based on the fact that larger particles in a solution go to the bottom of the container faster than smaller ones.

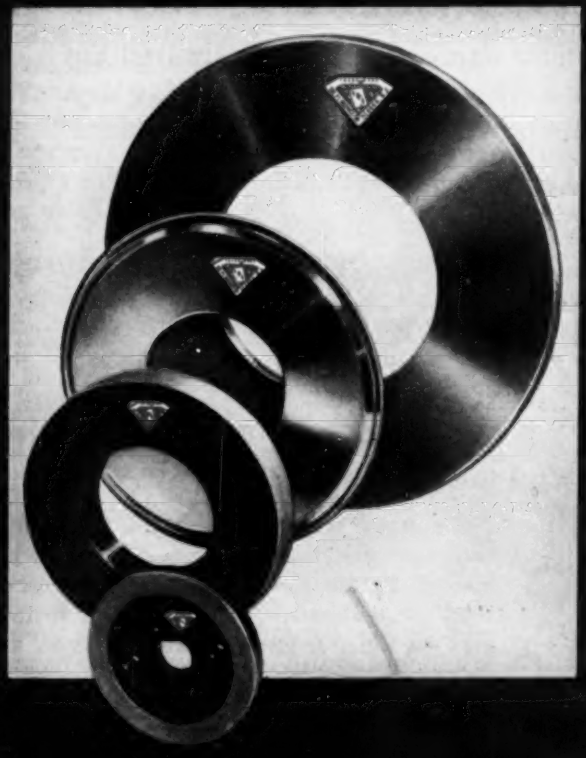
In this process, a solution of ungraded abrasive and water is pumped into a tank and allowed to settle for a period of time. The size of particle desired determines the time; as the particles become smaller, the settling period has to be lengthened.

The next step is to decant off the floating slurry to a second tank and dry the settled residue in the first one.

This process is slow. It requires considerable labor, a number of tanks, and a sizable floor area. Worst of all, it is inaccurate. There is no guarantee that all particles of a desired size will settle out in the time allotted; they might well be sucked up in the decanting operation and carried into another tank where they would be oversize.

At American Optical Company, one of the largest processors of corundum both for their own operation and for sale to other users, the tanks have given way to a battery of centrifugal classifiers which accurately produce six standard fine sizes

WE ARE ACTUAL MANUFACTURERS of EVERY BOND TYPE and SIZE DIAMOND WHEEL...



...we do not simply select a "suitable" size and shape per given bond — we manufacture all three bonds in all sizes as evidenced by our catalog =160. Write for it today.

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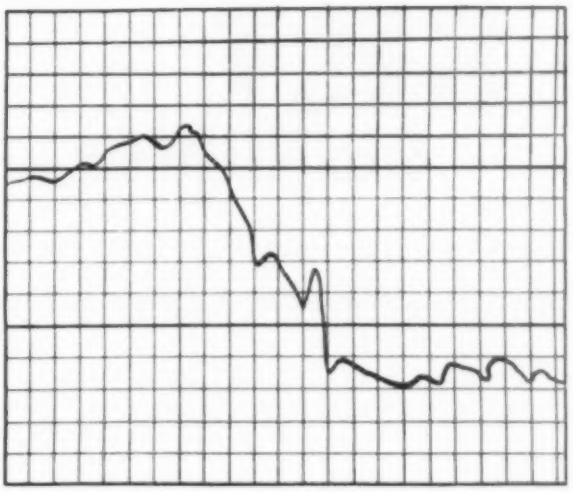
ranging from an average particle size of 22 microns down to an average of 5 microns. In any of the six grades, the size range from the largest particles to the smallest is not more than two "tenths."

Ungraded corundum from the ball mills is mixed with water in a tank with density control to regulate the percentage of solids in the slurry fed to the classifiers and with level control to regulate the running time. If the level in the tank drops to a point where uniform volume of feed is affected, the feed is automatically shut off until the tank refills.

The slurry is pumped to a Bird classifier that splits off the fines, everything under 5 microns. A second splits off everything over 25 micron size, and this material is returned for regrinding.

Effluent from the second classifier continues through a battery of other classifiers, each in turn providing the degree of centrifugal separating force required for its assigned size of corundum. The solids discharged from each classifier are the finished product in a semi-dry state, suitable for immediate use. Abrasive for sale is thoroughly dried, since any moisture in the material forms lumps in the package, and water can be added later in use.

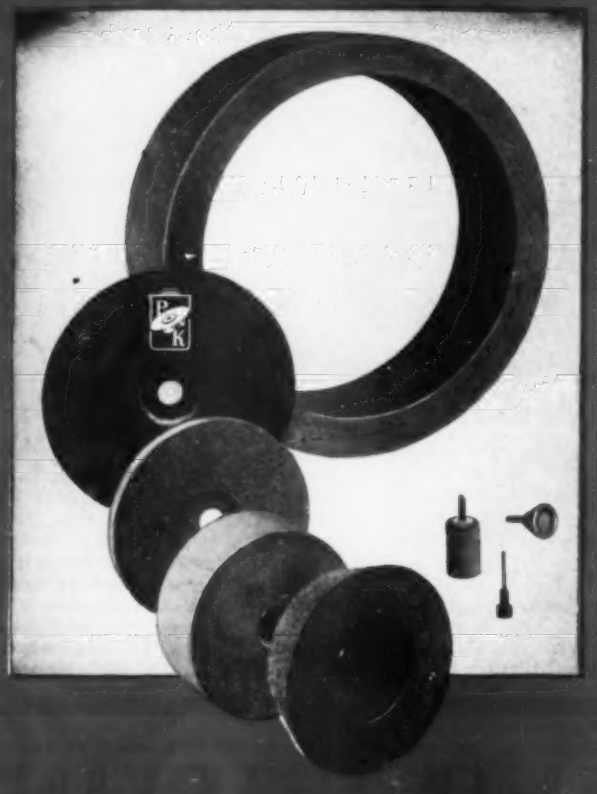
Accurate performance is maintained by controlling the volume through tank level control and pumps of regulated capacity.



The graph above indicates the abrupt drop in lens "casualties" with the introduction of corundum graded by the continuous centrifugal process.

Improved classification literally assures consistency of removal rate with scratch-free surfaces. This is vitally important in the surfacing of optical glass and electronic components, where close tolerances are held within definite time cycles. • • •

WE ARE MANUFACTURERS of RESINOID and RUBBER BONDED GRINDING and POLISHING WHEELS...



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★ reinforced rubber grinding wheels for high speed operation

★ combination grinding and polishing wheels for the cutlery industry

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"a leader in the industry"

For complete information write for literature or factory representative

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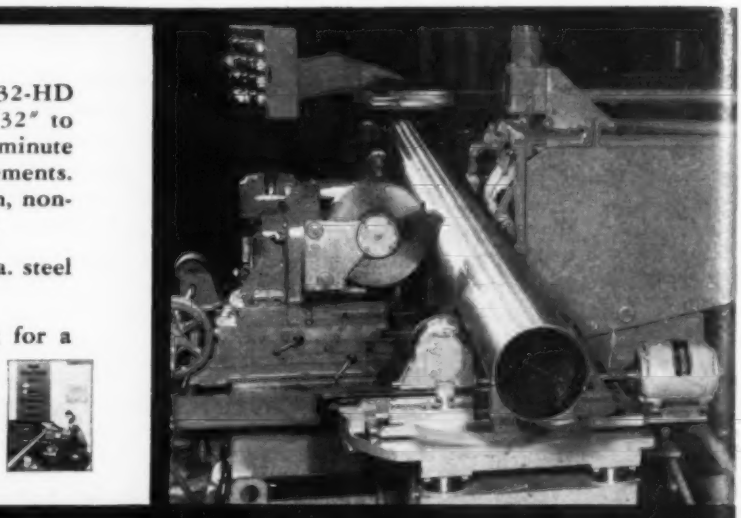
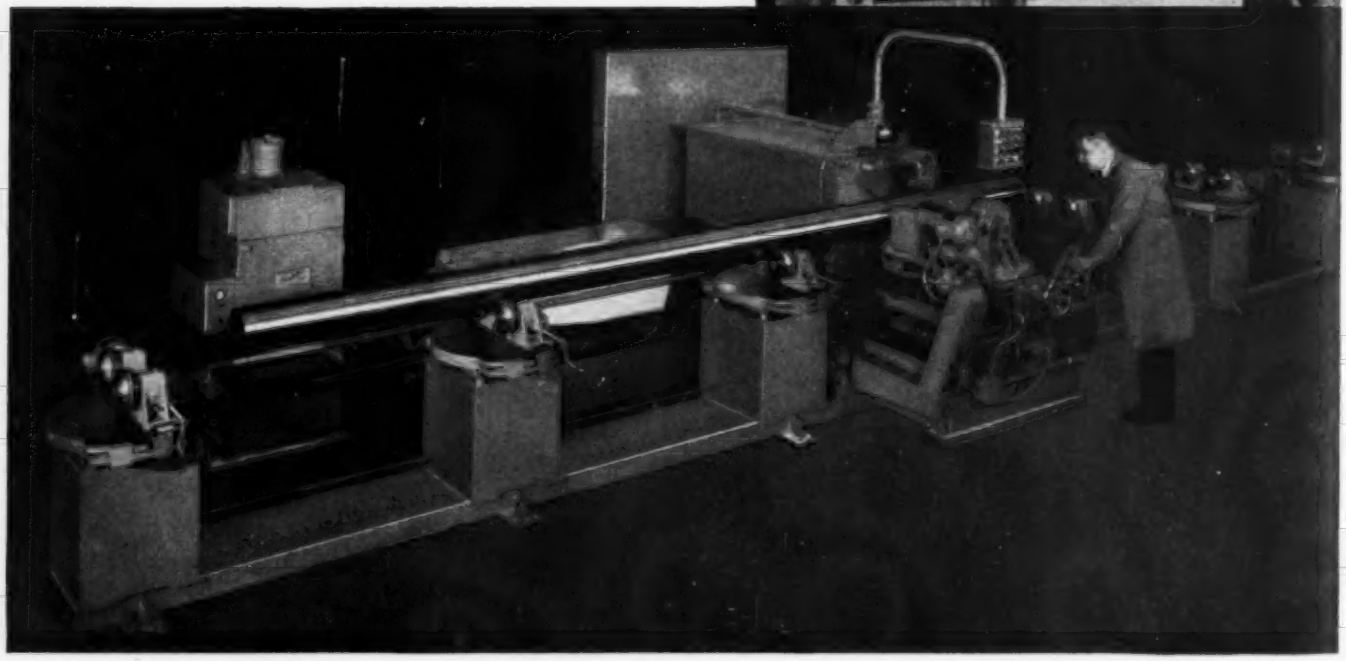
BELT GRINDING: combines rapid stock removal with improved quality on roughing and finishing operations

Take the new Sundstrand-Engelberg Model 8132-HD centerless belt grinder; it can handle stock from3/32″ to 8-1/2″ dia. at through-feed rates from 1′ to 40′ per minute — and produce to high finish and tolerance requirements. Also, because stock through-feeds in either direction, non-productive time on multiple-pass work is eliminated.

One user is removing .020″ stock per pass on 8″ dia. steel tubes at a through-feed rate of 7′ per minute.

For more information, send for literature and ask for a Sundstrand "Engineered Production" analysis of your final finishing operations to determine the economic benefits of abrasive belt grinding on your jobs.





CHECK THESE FEATURES OF ABRASIVE BELT GRINDING:

GREATER PRODUCTION. Because of higher speeds, more grinding area, simpler set-ups, and no time loss for truing or wheel dressing, production is higher. Belts are sharper due to grain orientation. Flexing works out chips for better cutting edge exposure. Change-over time is reduced to a few minutes. Roughing and polishing can be done with only one setup.

• • •

MORE VERSATILITY. Any material can be machined: metallic or nonmetallic. They're efficient for either mass production, small lots, or toolmaking. They're more easily automated than many other machines.

• • •

LOWER COST. Remarkable production lowers costs per piece. You don't need skilled labor for their operation nor elaborate, expensive fixtures. Belt grinders cost less initially than most other finishing machines. Also, belts are less expensive than wheels and are much easier to store and handle.

• • •

SIMPLE AND SAFE. Abrasive belt machining is safer because wheel hazards are eliminated. Operator fatigue is reduced and chips present no problems. Belts are easily changed by inexperienced personnel.

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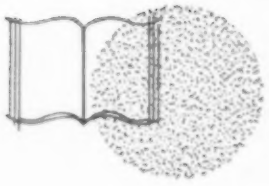


Literature

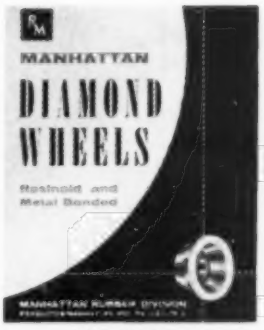
1. Diamond Wheel Catalog. Striking 28-page brochure includes considerable salient information on the use, care and selection of diamond wheels in addition to size, shape and price data. General applications for both metal- and resinoid-bonded wheels are discussed, along with suggestions for getting maximum service from diamond wheels. Wheel markings and ordering information are explained. Bulletin M1501. Manhattan Rubber Division, Raybestos-Manhattan, Inc., 61 Willett St., Passaic, New Jersey.

2. Belt Grinder Attachment. Four-page folder illustrates and explains the Jonvir belt grinder attachment, which is said to give any portable horizontal grinder, either air or electric, the advantages of abrasive belt grinding. Four different types are shown. The attachment can be used to grind on the contact wheel or on the unsupported belt. The Jonvir Manufacturing Co., 15733 Jas. Couzens Highway, Detroit 38, Michigan.

3. Surface Grinding Handbook. "The Art of Blanchard Surface Grinding," Fourth Edition, while not exactly new, is an informative and clearly-written discussion of surface grinding techniques, wheels and machines. It is understandably concerned mostly with Blanchard machines; however, much of the material is fundamental and widely applicable. Fifteen pages of specific applications indicate the variety of work that can be performed on this type of grinder. The Blanchard Machine Company, 64 State Street, Cambridge 39, Massachusetts.

4. Dust Filter. Two-color folder punched for three-ring binder tells the story of the AAF Foamat filter, a pleated-media unit in which the filter is a single sheet of perforated synthetic plastic material. The unit is said to eliminate media replacement, because the collected dust can be washed off while the filter is in place, or the filter can be removed for cleaning. Foamat filters are available in three models permitting capacities as high as 1800 cfm per cell, at velocities up to 450 fpm. Bulletin No. 208. American Filter Company, Inc., 215 Central Avenue, Louisville 8, Kentucky.

5. Handbook of Wheel Selection. Pocket-size pamphlet lists a wide variety of materials and tools, with general recommendations for grinding each. Across the center spread of the booklet is an explanation of the standard grinding wheel markings. Standard types of grinding wheels are sketched. Space for listing individual wheels on various plant applications is provided. The Fuller Merriam Company, 70 Water Street, West Haven, Connecticut.



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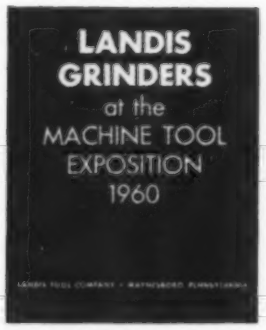

(See Number 6)

(See Number 7)

6. Grinding Machines Exhibited. Brochure lists and briefly describes the grinding machines exhibited by Landis Tool Company at The Machine Tool Exposition. For each machine there is a photo, an explanatory paragraph, a typical application, and a listing of special features. Landis Tool Company, East Sixth Street, Waynesboro, Pennsylvania.

7. Air Tool Buyers' Catalog. The complete line of Aro air tools, power motors and accessories, including a number of products just released within the past nine months, is covered in detail in a new 96-page air tool catalog just released by the Industrial Division, Aro Equipment Corporation. Edge markers on all pages offer the user easy reference to each section, without the need to consult an index. A new section featuring technical data applicable to the general line is included. All listings and specifications for the entire Aro line are up-to-the-minute. Catalog No. 64. Industrial Division, Aro Equipment Corporation, Bryan, Ohio.

8. Roll Grinding Wheels. Four-page brochure explains the wheel characteristics required in modern roll grinding, contains photos of various types of wheels, describes applications on various kinds of rolls. Complete roll grinding wheel recommendations are also included. Macklin Company, 2917 Wildwood Road, Jackson, Michigan.

9. Thread Grinder. Folder provides complete specifications and other details on a new Jones & Lamson Model 410 thread grinder, a small precision unit specifically designed for small-lot production. It is priced at under $10,000. Capacities between centers for the Model 410 are: 4" in diameter and 10" in thread length. The machine is applicable for both right- and left-hand thread grinding and will hold to .0005" on pitch diameter. Jones & Lamson Company, 522 Clinton Street, Springfield, Vermont.

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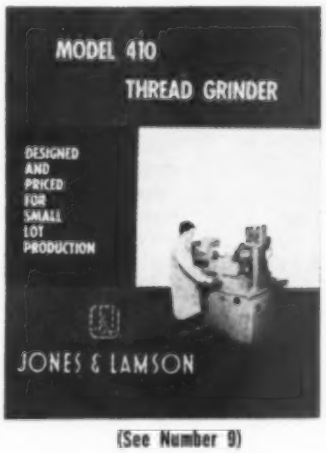

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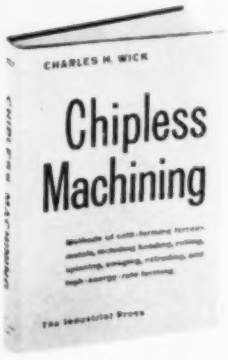
This basic, technical guide describes and illustrates in detail the newer methods of cold forming, gives pertinent data on economics resulting from savings in time and materials, and evaluates advantages and limitations of various processes and their applications. Covers cold-heading, thread rolling, spline rolling, power spinning, rotary swaging, radial forging, cold forming, cold extrusion and explosive forming. **Of special value to** top management, design engineers, process planners, tool engineers and production men because emphasis is on practice —not theory.



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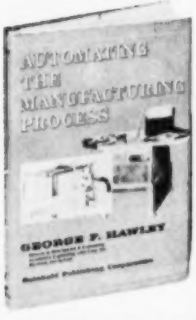

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Automation Engineering Laboratories

This fine book discusses in practical terms some of the problems involved in developing automatic equipment for such specific operations as assembly of components and packaging of individual products. Valuable to both management and production personnel as well as to designers and development engineers. Its intensely practical approach to complex mechanical problems will appeal to all who are confronted with automation problems.

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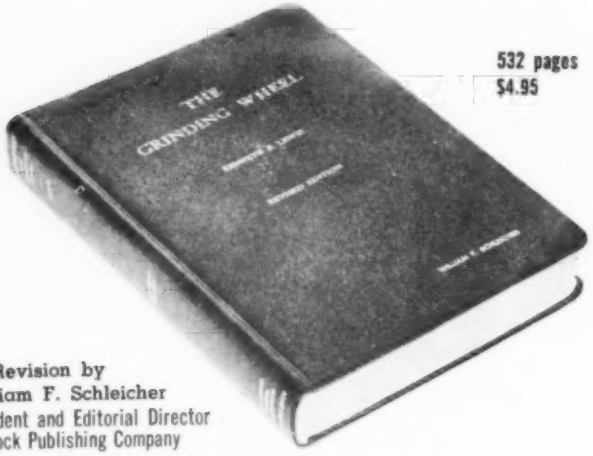

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FREE LITERATURE *continued*

10. Barrel Finishing Supplies. A new 4-page illustrated brochure describes in detail Tumb-L-Matic's complete line of barrel finishing compounds, abrasives, soaps and general media. In addition to an exhaustive listing of materials, the folder also contains information for use as a general guide in selecting the proper media for both wet and dry tumbling operations. Tumb-L-Matic, Inc., 65 St. Mary's Street, Stamford, Connecticut.

11. Barrel Finishing. Twenty-one case studies of parts whose finishing costs have been reduced by a change to barrel finishing are included in this 16-page brochure. While most of the applications cited are of relatively small or medium-sized piece parts, irregularly shaped, some larger parts are also included. Suggestions for media and compounds complete the booklet. Minnesota Mining and Manufacturing Company, St. Paul, Minnesota.

12. Diamond Impregnated Products. Catalog presents descriptions, specifications and prices for the Steelset line of diamond products from Fish-Schurman Corporation. Aside from the standard information, two sections appear to be of value to the user. On the last three pages are listed in outline form a number of operating suggestions and recommendations under these headings: Machines, Coolants, Operating Speeds, and Wheel Selection and Economy. Fish-Schurman Corporation, 70 Portman Road, New Rochelle, New York.

(See Number 13)

13. Machine Catalog. A new and condensed 12-page catalog entitled "Gisholt Machines" briefly covers their Masterline machines. It contains short discussions and specifications for their machines, but more detailed information is available for each in specific literature. Form 1126-N. Gisholt Machine Company, 1245 East Washington Avenue, Madison 10, Wisconsin.

14. Dry Abrasive Cutter. A well documented four-page folder, Bulletin DH-299, describes the Model A-2 Sever-All dry abrasive cutting machine. The 2-A Sever-All offers a fast, economical method of cutting solids, tubing, and structurals—

A NEW "COMPACT" HITS THE MACHINE TOOL FIELD...

THE NEW HARIG 612 SURFACE GRINDER

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* **Automatic forced lubrication** goes into operation as soon as machine is started — triples life of the ways and preserves original accuracy.
* **Direct drive spindle** increases power . . . reduces vibration . . . no V-belts to replace.
* **Your choice of right or left hand longitudinal feed**

All Standard Equipment

The new 612 represents a break-thru in design and construction whereby Harig now offers industry a low-cost, precision surface grinder loaded with features usually found only on expensive models. Easy to operate . . . requires little maintenance . . . built with the precision quality you expect from Harig.

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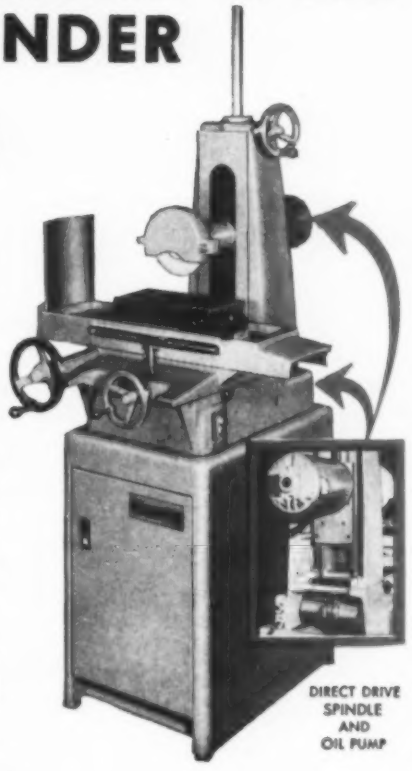

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Easily grinds irregular shaped perforators concentric with shank within ± .0001 accuracy. Also can be used for milling, boring, inspection, and radius dressing. New features include v-block adjusting screw and sine arrangement to obtain any desired angle.

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WHATEVER YOUR TOOLING REQUIREMENTS . . . HARIG IS READY TO SERVE YOU!

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WHY MICROHONING* helps Hawk Guidance System "think" straight

The Army-Marine surface-to-air Hawk missile is the first of its kind to overtake and destroy a ballistic missile in a simulated enemy attack. Designed by Raytheon's Missile Systems Division, it is being built at their Andover, Massachusetts plant.

Representative range of valve sleeves Microhoned.

MICROHONING GENERATES ACCURACY

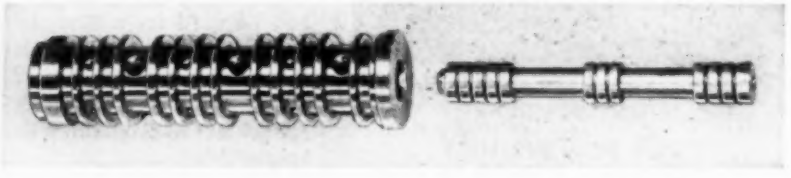
With consistent accuracy as a prime requisite, Raytheon engineers specify Microhoning in the processing of valve sleeves and blocks used in the servomechanism that guides the Hawk in its supersonic flight. Microhoning of bores rectifies geometric inaccuracies, size is held within .0003", roundness within .0001" tolerance, and a surface finish of about 8 microinches (rms) is generated.

MICROHONING'S VERSATILITY

Thirteen different sizes of sleeves and blocks are Microhoned, including those with blind-end, interrupted, and ported bores. Parts, which are generally of stainless steel heat treated to 58-60 R "C", have bore diameters ranging from .171" to .874" and lengths from .594" to 2.859".

STRAIGHT, CLEAN BORES

Microhoning of these components effectively corrects camber or bow in the bore and assures less smear around the ports than possible with any other machining method. Bore camber and smear could cause binding or a hindering action between the sleeve and its spool, and thus throw the missile off-course.



The strong emphasis on precision can best be appreciated in the realization that sleeves and mating spools must operate within a clearance of only 100 to 150 millionths of an inch. The fit of the spool within the sleeve must prevent blow-by. A final lapping operation provides geometric accuracy within .000050" tolerance.

For further details, see facing page.

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FREE LITERATURE *continued*

cold-rolled steel, alloy steel and stainless steel—cast iron, and many non-ferrous metals. It will cut solids up to 4" square, standard pipe and tubing up to 6" diameter, angle iron up to 6" x 6", and channels up to 8". Complete specifications are listed and data on optional accessories included. Allison-Campbell Division, American Chain & Cable Company, Bridgeport, Connecticut.

15. Abrasive Tech. Belt grinding, with two articles, dominates the August issue of the Behr-Manning external publication. Featured Machine of the Month is a 36" rubber roll grinder. Two short articles on lubricants and the selection of contact rolls complete the issue. Behr-Manning Co., a division of Norton Company, 560 Howe Street, Troy, New York.

16. Surface Grinder. Oversize folder introduces the DoAll Model DH-612 (6"x12") surface grinder, a manually operated unit with optional hydraulic table traverse. Advantages of the machine are explained, and optional equipment is listed. The DoAll Company, 254 North Laurel Ave., Des Plaines, Illinois.

(See Number 17)

17. Portable Grinding Tools. A 36-page catalog on portable precision grinding tools and small hole drilling equipment has just been published by Dumore. It includes all specifications, sizes, capacities, and suggested applications for tool post grinders, flexible shaft tools, grinding accessories, and related equipment. Catalog 60-FL. The Dumore Company, 1300 Seventeenth Street, Racine, Wisconsin.

18. Diamond Wheels. New diamond wheel catalog from American Coldset contains six pages of useful information as well as the conventional shape, size, concentration and price information. Shape types are pictured and indexed in the table of contents. The identification code is explained fully. Two pages of tips on the care and application of diamond wheels, in easy-to-follow outline form, add to the value of this brochure. American Coldset Corporation, U. S. Route 46, Teterboro, New Jersey.

19. Diamond Coated Steel Tools. Two-color, 16-page bulletin lists specifications and suggested applications for a variety

of diamond-coated steel tools—saws, drills, planers and shapers. In addition, the article contains three feature articles on machining hard plastics with diamond tools. Dia-Chrome Company, 612 West Elk Avenue, Glendale 4, California.

20. Coolant Settling System. Four-page, two-color bulletin describes the advantages of a new Olson conveyorized settling system in separating large particles from mineral-type oil or water-soluble coolant. It also outlines three easy ways for plant management to make sure that settling is right for their particular plant operation. It offers, without obligation, dimensional drawings of the new settling system. Olson Filtration Engineers, 5024 Section Avenue, Cincinnati 12, Ohio.

21. Safety Glasses. Marking the introduction of American Optical's new "Dura-Safe" safety glasses is a full color brochure illustrating and describing the line, as well as providing brief discussion of the various features of the product. Brochure S-1013. American Optical Company, Safety Products Division, 81 Mechanic Street, Southbridge, Massachusetts.

22. Oscillating Belt Grinders. Detailed descriptions of Tri-Matic oscillating belt grinders, in 12" through 48" sizes, with specifications and typical applications, plus similar information for the Tri-Matic oscillating sheet surfacer using abrasive impregnated nylon are contained in a new brochure, Form TM860. Sales Service Mfg. Co., 2363 University Avenue, St. Paul 14, Minnesota.

(See Number 23)

23. Vertical Grinding Machines. Four standard and one custom series of precision vertical machines for contour and conventional grinding and turning are described in Frauenthal's new 8-page Bulletin 560. The five types of machines use vertical design to eliminate the deflection normally encountered when large unsupported parts are machined in a horizontal position. Bulletin 560. Frauenthal Division, The Kaydon Engineering Corporation, McCracken Street, Muskegon, Michigan.

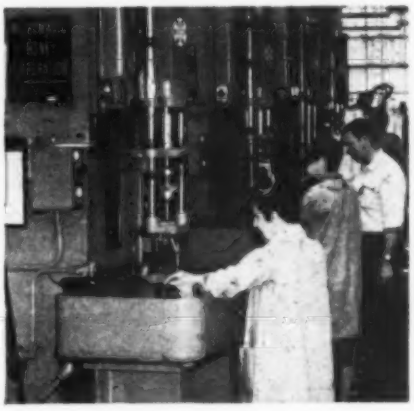
24. Grinding Wheels. Four-page folder punched for standard three-ring binder describes the DoAll line of surface grinding wheels, listing sizes, specifications, and related information. The DoAll Company, 254 North Laurel Avenue, Des Plaines, Illinois.

25. Precision Grinders, Spindles. Packet of literature from Parker-Majestic, Inc., contains literature describing their line of surface grinders, internal grinders, and motorized spindles. Parker-Majestic, Inc., 147 Jos. Campaue Avenue, Detroit 7, Michigan.

• • •

HOW MICROHONING corrects camber in components of Hawk Missile

Raytheon, designer and builder of Hawk missiles, is constantly seeking to improve processing methods and attain greater precision-production. One example of this is the processing of valve sleeves and blocks used in the steering mechanism of Hawk missiles. Here's how Microhoning corrects bore camber, minimizes smear around ports, generates geometric accuracies and microinch surface finishes.



CORRECTING BORE CAMBER

To straighten bore surfaces so that they are parallel throughout their length to the neutral axis of the bore, Microhoning utilizes the combination of: abrasive sticks of exact length, positive radial expansion of abrasives, and controlled rotating and reciprocating motions of the Microhoning tool.

Each Hydrohoner has automatic *size control, stonefeed and stonewear compensation.*

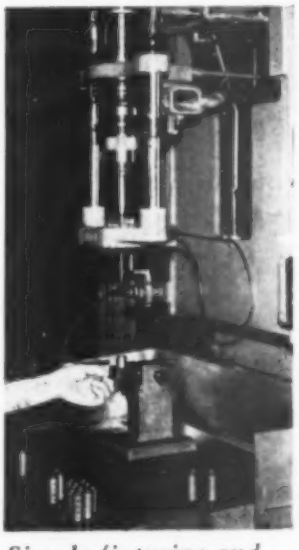
MINIMUM SMEAR AT PORTS

Thirteen different sizes of sleeves and blocks are Microhoned, including those with blind-end, interrupted, and ported bores.

The Microhoning characteristics of low-velocity abrading and constant widespread contact with bore surfaces eliminate more smear around the ports than is possible with any other machining method.

EFFICIENT PRECISION PROCESSING

In two Microhoning operations, from .002" to .006" stock is removed from the bores at an approximate rate of .001" per minute. The rough Microhoning removes from .001" to .005" stock while correcting camber to within .0003". The finish Microhoning rectifies geometric inaccuracies resulting primarily from heat treating of parts. Size is held within .0003", roundness within .0001" tolerance, and surface finish generated is about 8 microinches, rms.



Simple fixturing and hand loading are part of this careful processing.

For further details, see facing page.

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

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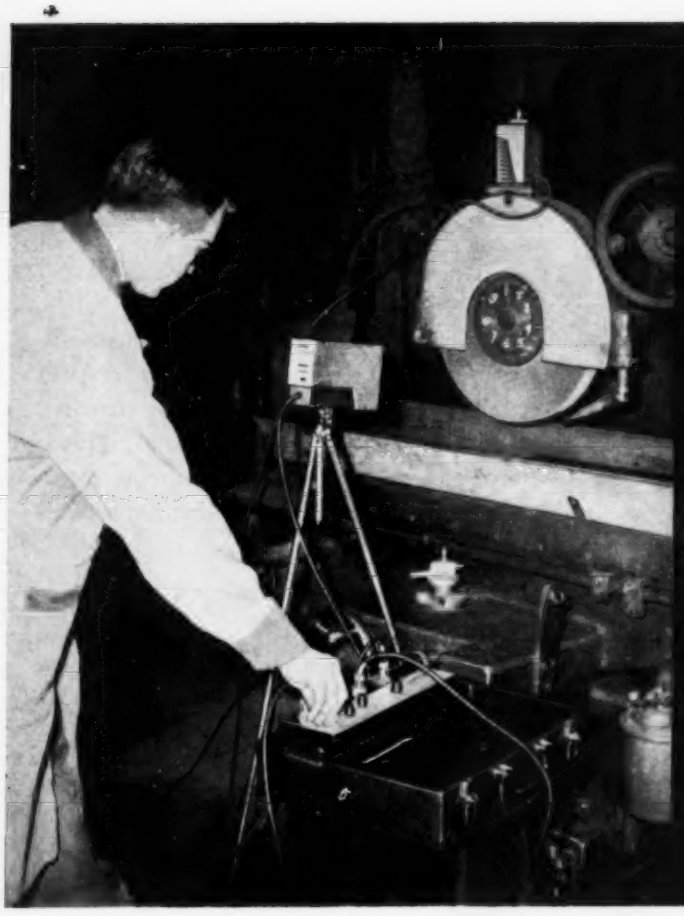

Solve the problem of on-the-job precision grinding wheel balancing,

QUICKLY, ECONOMICALLY!

Stewart-Warner's new Model 2390 Portable Balancer is specifically designed for in-place balancing. New balancer is high on sensitivity and surprisingly low in price!

Shop-designed for precision on-the-job balancing:
1. Strobe light and meters mounted in same portable head for easy one-man operation. 2. Removable lightweight electronic unit for easier balancing in confined spaces. 3. Electro-magnetic pickup can be simply placed on machine part, freeing operator's hands.
1
2
3

Finer finishes and closer tolerances demand precision grinding wheel balance.

Wheels last longer with longer runs before re-dressing. Machine down-time is kept at a minimum by balancing on grinder spindle under actual operating conditions.

Strobe light and meter quickly disclose amount and angle of unbalance. Where precision balance is not required, the 2390 still cuts balance time to ⅓ that of static method.

The Stewart-Warner 2390 Portable Balancer offers the lowest cost, compact, precision, electronic balancer made! Ask for a demonstration. Write for free catalogs.

Symbol of SW Excellence

STEWART-WARNER CORPORATION

INDUSTRIAL BALANCER DEPARTMENT

Dept. BP-110, 1850 Diversey Parkway, Chicago 14, Ill.

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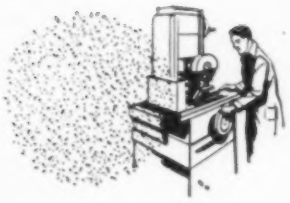


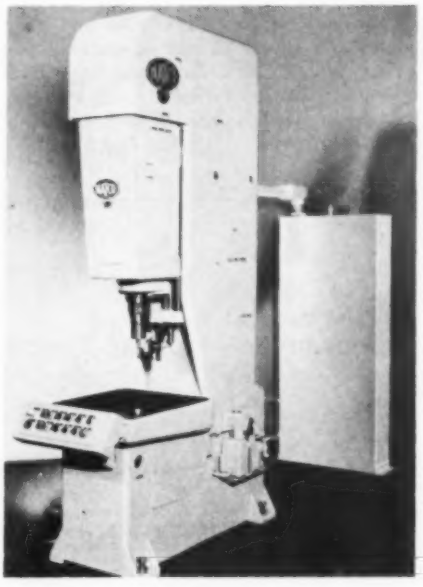
Equipment and Materials

New MECHANICAL Honing Machine Introduced by Natco

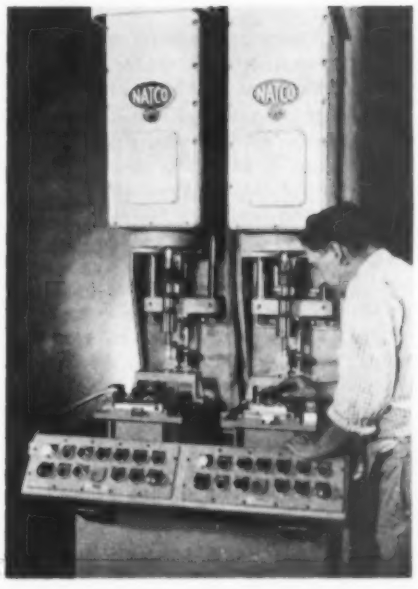
In cooperation with the Jes-Cal Co. The National Automatic Tool Company has developed a completely new mechanical honing machine for bores from ½ to 3" in diameter and up to 3" in length. In this range the machine has been developed to hone such parts as pinion gears, connecting rods, rocker arms, engine and compressor components, hardened drill bushings and similar high production parts.

This machine is designed specifically to use the proven Jes-Cal honing tools. The Natco/Jes-Cal Mechanical Honing Machine, equipped with Jes-Cal tooling, is reportedly capable of honing uniformly and consistently within .0003" limits for total size, taper and roundness while creating any degree of surface finish required at normal production rates.

The tools are equipped with a unique, patented carbide size-control gage which enters the bore when a predetermined diameter is obtained and automatically ends the honing cycle. Operation is entirely electro-mechanical with no air or electronic mechanisms involved. The gage, mounted on the tool above the stones, is under tension. On each stroke of the tool, the gage touches the bore and thus is restricted from entering until the bore reaches size. When the bore comes to size, the gage passes far enough to trip a limit switch which collapses the tool, retracts the head and completes the cycle.



Mechanical honing machine is reported to hold within .003" for total size, taper and roundness, while creating any desired surface finish.



Machines can be arranged singly or in multiples, as above, on a common base, with automatic fixturing for loading, unloading and gaging.

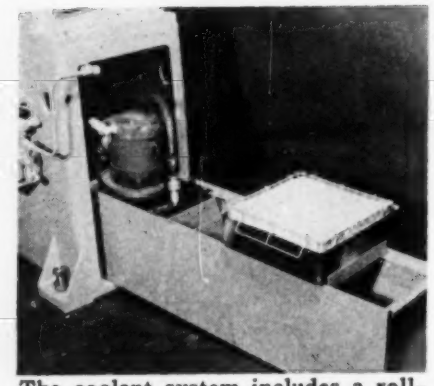
These connecting rods, pinion gears, rocker arms, engine and compressor components are typical of the wide variety of pieceparts for honing.

Short, interrupted and ported bores of hard or soft materials and materials of varying characteristics in the same bore can be honed by this machine.

Feed-out of the honing stones is under control of a pressure cage in the head of the machine. This mechanism actuates a pushrod which transmits the pressure to the stones. The pressure cage is so designed that it constantly diminishes stone pressure as the bore nears final size. Design provides for rapid approach of the tool to the work and automatic expansion of the stones within the bore. Feed-out of the stones begins immediately and the honing progresses until specified bore size is reached as determined by the gage. Then the tool automatically contracts, withdraws rapidly from the work and the cycle is ready to be repeated. Control lights warn when stones need replacement and when they are contracted to the proper limit for changing.

Natco/Jes-Cal Mechanical Honing machines conform to JIC standards. All the expansion, actuating and adjustment mechanisms are contained in the head assembly. A single motor (1½, 2 or 3 hp) powers the spindle drive shaft both in reciprocation and rotation. Rotation speeds are fixed by pick-off gears from 200 to 800 rpm. Reciprocation is also set by pick-off gears between 60 and 200 strokes per

continued



The coolant system includes a roll-out tank in the machine base.

minute. Stroke adjustment is made by means of serrated adjustable eccentric, in increments of .001".

Oil mist automatically lubricates all moving parts in the head. The coolant is held in a separate roll-out tank stored in the base of the machine, thus not requiring floor space and providing easy clean out. Tools and gages are protected by safety latch locks which hold head in position if air pressure is reduced below safe working conditions.

The National Automatic Tool Co., Inc., South 7th and N Streets, Richmond, Indiana.

Use postpaid card. Circle No. 31

Lapping Unit Laps Recessed, Standard Center Holes 1/16" Up

A new center lapping machine from J & S Tool Company, Inc., makes it possible to lap standard as well as recessed center holes from 1/16" diameter and larger at highly increased rates of production, according to the manufacturer.

Designed to lap both centers simultaneously in pieces up to 8" long, the J & S small center lapping machine has two opposing precision high-speed spindles which are individually driven by 10,000 r.p.m. motors with reversible switches.

One spindle is mounted on ball ways to permit a gentle lapping motion. The workpiece is held in two adjustable V's, allowing center holes to be offset in relation to the diamond lap. This creates a semi-grinding operation in conjunction with a small differential speed of the spindles, which also produces the rotation of the parts.

Other important features include interchangeable diamond-impregnated center laps, and mist coolant mounted in position for cooling and cleaning the laps and centers.

J & S Tool Company, Inc., 87 Dorsa Avenue, Livingston, New Jersey.

Use postpaid card. Circle No. 32

Portable Belt Grinder Uses Backstand Idler Principle

Said to provide faster grinding and finishing of metal than possible with any other portable power tool, the new Aro portable belt grinder combines the backstand idler principle of abrasive grinding with power and portability for greater flexibility and efficiency in grinding and finishing operations than has heretofore been possible with backstand idler installations.

Aro reports that this new tool will grind and finish in one operation, because the abrasive belt method leaves a smooth, straight line finish, with no gouges or swirls left in the work to require further finishing operations.

Live action of the coated abrasive belt running at high speed (7000 sfpm belt speed) over a resilient rubber contact wheel with slotted face actually sets the abrasive grains "on edge". This provides a shearing action unduplicated by any other portable power tool, and increases grinding and finishing speed.

Aro claims that chattering, bumping or bouncing have been eliminated with the new belt grinder, even when working on extremely rough or irregular surfaces, due to the resilient rubber contact wheel which supports the abrasive belt.

The tool is powered by a 2 H.P. air motor for handling toughest grinding and finishing jobs. Balance and visibility are said to be excellent, because the tool was completely designed for belt grinding—is not an attachment or a makeshift adaptation of a tool designed for other work.

Hardness of contact wheel is optional. Medium, hard or extra hard wheels are available, progressing in that order from the grind and polish wheel to the hardest for aggressive stock removal. 1" or 2" contact wheels may be used, without spacers or adapters, providing belt width options of 1" or 2".

ARO Equipment Corporation, Industrial Division, Bryan, Ohio.

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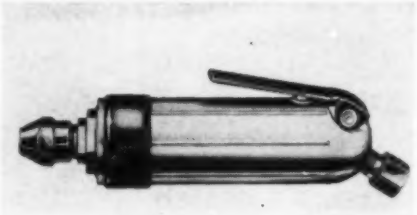
Air Die Grinder Delivers 0 to 25,000 Controllable RPM'S



Superior Pneumatic's new Model 1600 air die grinder is equipped with a metering trigger that delivers 0 to 25,000 controllable rpm's and lets the operator "throttle down" for feather edging.

Applications recommended by the maker for the grinder are polishing, wire brushing, and metal removal on dies, stampings, gear teeth, plastics, tubes, castings, and weldments.

The grinder will accommodate standard or carbide wheels, mounted wheels and points, wire brushes, and sanding drums. Grinding wheel capacity is 1¼" in vitrified bond, and 1½" in organic bond.

Air consumption of 6 cfm at 90 psi is said to be half that of conventional units. Weight is 15 oz.; length, 6". Price complete, $89.50.

Superior Pneumatic & Mfg., Inc., 13800 Enterprise Avenue, Cleveland 35, Ohio.

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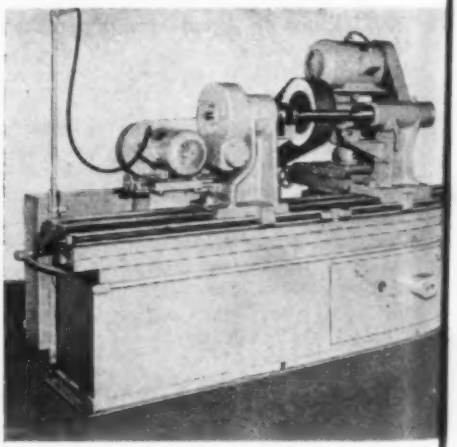
Automatic Machine Polishes or Buffs Shafts and Rolls Up To 32" Dia. and 72" Long



New lathe type automatic polishing and buffing machine finishes shafts and rolls up to 32" in diameter and 72" long to 2 rms. A standard Acme motorized buffing lathe with belt arm attachment is connected directly to the base of the machine.

Abrasive belts or buffing wheels can be applied to permit either polishing or buffing operations, or a combination of both, to perform the desired type of finishing operation.

A head stock and tail stock assembly with variable speed spindle drive is mounted on a heavy duty type variable speed reciprocating work table. The head stock, tail stock and buffing or

polishing heads are easily adjusted for different part lengths and diameters.

A cycle timer controls the number of buffing or polishing passes.

Acme Manufacturing Co., 1400 E. Nine Mile Rd., Detroit 20, Mich.

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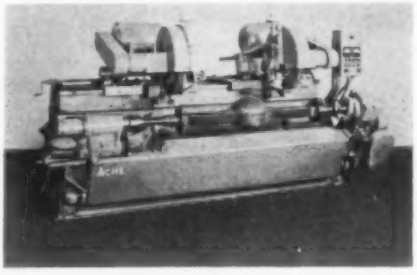
Automatic Grinder Grinds Weld Bead from Housings, Square Bars



A new automatic axle housing grinder that grinds weld flashing from square and non-cylindrical shaped axle housings, from Acme Manufacturing Company, can also be used to grind non-cylindrical shafts and bars.

The machine basically consists of two adjustable grinding heads mounted on a reciprocating slide and a pivoting work holding assembly with two live centers which positions and rotates the axle housing during the grinding operation.

The grinding wheels are controlled by a floating cam action that follows the contour of the axle housing. The reciprocating action of the grinding wheels insures uniform wheel wear.

One of the live centers of the work holding assembly transmits rotation to the axle housing during grinding operations while an adjustable steady rest, which houses the other live center, supports the opposite end of the housing. The steady rest assembly is actuated transversely by a pneumatic cylinder for loading and unloading axle housings.

An automatic timer controls the grinding cycle. Grinding time can be set from 10 seconds up to 20 minutes depending on the grinding application.

In operation, axle housings are mounted on brackets between the live centers on the pivoting work holding assembly. The steady rest mechanism then moves transversely and locates the axle housing on the live centers. The work holding assembly then moves into grinding position. As the work holding assembly pivots, the axle housing is rotated and the grinding wheels start reciprocating. When the housing is pivoted into grinding position the grinding wheels immediately contact the weld flash on the housings. Upon completion of the grinding operation, the housing pivots outward from the grinding wheels to the unload position.

The two grinding heads are powered by 7½ hp motors. The machine occupies a floor space approximately 5 feet by 12 feet and is 5 feet high.

Acme Manufacturing Company, 1400 East Nine Mile Road, District 20, Mich.

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Abrasive Belt Grinder Provides Dustless Operation

Dust-free grinding is a major benefit of the new Model 445 Skil 4" belt sander, according to the Chicago power tool manufacturer. Vacuum dust pick-up attachment is said to be 90% efficient when sanding resins, lead or wood, allowing sanding and painting in the same general area.

Belts reportedly sand faster and last longer because clogging is minimized. Contour sanding is easier, better because of exclusive soft sponge rubber pad. Full 4" belt has 20% more sanding surface than ordinary 3" dustless sanders, yet the Model 445 weighs 20% less.

Design allows flush sanding up to vertical surfaces. Gearless transmission never needs lubricating.

Skil Corporation, 5033 Elston Avenue, Chicago 30, Illinois.

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Wet Polishing Cloth Cuts Time, Improves Surface Finish

For microinch and optical polishing, the Pellon® polishing cloth is said to provide a scientific approach to a process once considerd an art.

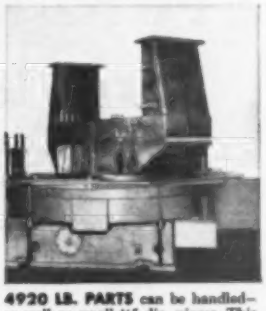
Advantages claimed for this cloth are: reduction in polishing cycle time;

A LAPMASTER CAN MEAN BIG SAVINGS...A BETTER PRODUCT

here are more examples of how:

HIGH PRODUCTION RUNS or small lots—both turned out with *consistent* accuracy on a Lapmaster. Day-in-day-out production rates range from a few pieces to thousands per day.

FLATNESS OF .0000116" or less with a micro-inch finish of 2 to 3 RMS is everyday work for a Lapmaster. Uniform accuracy maintained piece-after-piece because conditioning rings automatically keep lap plate flat.



4920 LB. PARTS can be handled—as well as small ¼" dia. pieces. This 84" dia. weldment for a radar tracking antenna was lapped to a flatness and parallelity within ± .00005" on a Lapmaster Model 84.

TALL and SMALL PARTS AT THE SAME TIME. No expensive fixturing required...in most Lapmaster applications only inexpensive masonite or micarta work holders are necessary. Eliminates danger of stresses and warpage usually caused by clamping during grinding.

EXTERNAL and INTERNAL LAPPING IN ONE OPERATION. Versatility of the Lapmaster is demonstrated in this lapping operation on R. R. air brake parts. Reciprocating mechanism runs small lapping block in and out of work while other parts are being lapped on plate.

SHAPE OR FORM NO PROBLEM. Special lap plate and work holder permit lapping of swing check valve. Other simple attachments and holding devices can be furnished to facilitate lapping of "hard-to-handle" or extremely large parts.

Lapmaster ...THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

WRITE FOR THE COMPLETE LAPMASTER STORY

Write for bulletins describing the Lapmaster line and chart on measuring flatness.

A product of

Crane Packing Company

6417 OAKTON STREET • MORTON GROVE, ILLINOIS (Chicago Suburb)

In Canada: Crane Packing Company, Ltd., Hamilton, Ont.

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surfaces free of scratches and orange peel effect; long life; good use of polishing compound; and elimination of rolled edges.

The polishing cloth is available with a water-resistant adhesive backing, with an oil- and kerosene-resistant adhesive backing, or with a plain backing.

Pellon Corporation, Industrial Division, Empire State Building, New York 1, New York.

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New Mike Standard End Measure Introduces Lapped Flat End

A major functional advance featured in a new Slocomb line of standard end measures for testing micrometers is that one end is lapped flat and square. The other is spherical.

In conventional end measures both ends are spherical.

The advantage of the flat end is that it gives a positive locating face and assures that the end measure is properly aligned to the micrometer measuring terminals, it is said.

Standard end measures are available in sizes from 1" through 54". Sizes up to 12" are made from tool steel of .312" diameter. Larger sizes through 54" have a 7/76" diameter body.

J. T. Slocomb Co., 65 Matson Hills Road, South Glastonbury, Connecticut

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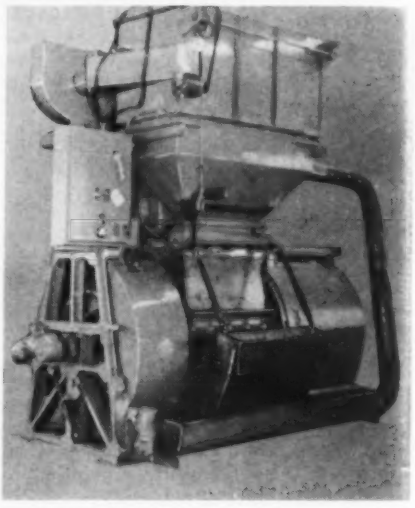
"Harperizer" Claims Buffing Finish with Loose Abrasive



The Roto-Finish Company, Kalamazoo, Mich. has been appointed manufacturing licensee of the new "Harperizer" finishing machine. The machine is designed to produce a finish equal or superior to buffing on parts with intricate detail, ornamentation, or complex shape.

Using a fine loose abrasive, the Harperizer utilizes a high centrifugal force which holds parts and media together in a tight mass. Processing time is short. No fixtures or buffs are necessary.

Parts which can be processed in the "Harperizer" range from watch screws to automobile headlamps. The rate of production is high on such parts as cams (from 80 to 18 micro-inch finish without distortion), stainless steel flatware, golf clubs, brass plumbing fixtures, and molded plastics.

The Roto-Finish Company, 3700 Milham Road, P.O. Box 988, Kalamazoo, Michigan.

Use postpaid card. Circle No. 40

Ultrasonic Impact Grinder Machines Semiconductors

A new, faster-operating ultrasonic impact grinder that can machine an area up to 1⅜" in diameter has been shown for the first time by Raytheon Company.

The new Model 2-333 is especially designed for precision machining operations in the manufacture of semiconductor and other electronic devices. It can also be used for general purpose work including cleaning and soldering.

Featuring the first air-cooled, 300-watt magnetostrictive transducer offered in a machine tool, the Raytheon Model 2-333 eliminates bothersome

continued

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POWDER'D OIL

Works Perfectly on 98% of all types of Wet Grinding and thus saves you buying several ferrous-metal coolants for different wheels.

- Settles grinding dust quicker than any other coolant, *even water.*
- Packs grinding dust down to prevent it from recirculating.
- Produces finer finishes, improves production and saves "down time" by keeping machinery cleaner and rust-free.
- Positively won't load grinding wheel.
- Never turns rancid or gummy.
- Keeps work visible at all times—no stopping to clean away coolant.
- One drum does the work of four drums of soluble oil, thereby taking 75% less storage space.
- Costs up to 60% less to ship because it contains no water and comes in disposable, no deposit fibre drums.
- Dissolves instantly in any kind of water to form a clear green solution that's stable and won't foam under any condition.

Available in 50 lb., 125 lb. and 400 lb. drums.

Prove in your own plant the greater efficiency and economy of Powder'd Oil. Write today on your company letterhead for a generous sample . . . without obligation.

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Readers' Service Division

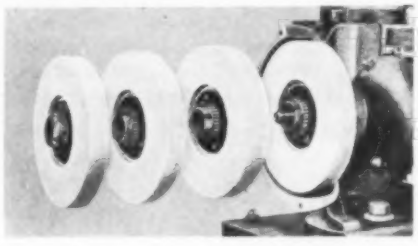
plumbing arrangements generally associated with liquid-cooled units. The magnetostrictive transducer provides continuous operation, eliminating down-time for cooling often necessary with ceramic transducers.

The transducer is an insert-type so that either the coil or the transducer can be removed without disturbing the other.

Commercial Apparatus and Systems Division, Raytheon Company, 1415 Providence Turnpike, Norwood, Mass.

Use postpaid card. Circle No. 42

R-O Mounts and Adapters Simplify Wheel Interchange



A new taper spindle and wheel mounts for the R-O grinder are said to speed up the job of changing wheels. The mounts have 3" TPF, I. D.

Predressing all the wheels for a job and interchanging them faster, it is claimed, simplifies the job of sharpening multi-cut tools.

Taper wheel mounts are available for wheels 1/16", ¼", ½", and ¾" thick. Special wrenches are provided for removing the wheels from the mounts and the mounts from the spindles.

R-O Manufacturing Co., 31171 Stephenson Highway, Madison Heights, Michigan.

Use postpaid card. Circle No. 43

Collet Actuator Redesigned for 1⅜" O.D. Draw Tube

Changing the design of PowerGrip's Model 26A collet actuator permits the use of a 1⅜" O. D. draw tube with 1-1/16" I. D.

continued

The Beginning of a Revolution!

Look for "G"—the identifying prefix of a J.K.S. Man-Made Diamond Grinding Wheel.

G D100 R100 BE ⅛
J. K. SMIT & SONS

J.K.S. Diamond Wheel Developments Slash Grinding Costs—Speed Production

Now, one of the world's most experienced manufacturers of diamond grinding wheels has brought its technical knowledge to the production of man-made diamond wheels.

The result is a revolutionary advance. Today's new J.K.S. man-made diamond wheels give longer life in many applications . . . speed up production on many difficult grinding jobs. Yet there is no extra cost . . . they are now priced the same as wheels made with natural diamonds.

In these wheels, too, you get a famous J.K.S. plus value: exact uniformity in wheel construction . . . duplicated in wheel after wheel . . . an advantage that results from special J.K.S. techniques and quality control.

NEW DIAMOND WHEEL CATALOG NO. 65

A necessary reference publication for everyone who buys or uses diamond grinding wheels . . . send today for Catalog, "J.K.S. Diamond Wheels, Saws and Hones."

SUPER MATERIAM IGNIS TRIUMPHANS

J. K. Smit & Sons, Inc.

Home Office and Plant

MURRAY HILL, NEW JERSEY

DETROIT, MICH.

Use postpaid card. Circle No. 244

The standard draw tube can be attached to a 5C collet, which will take a maximum of 1" round stock. Draw tubes for smaller collets can be furnished if specified.

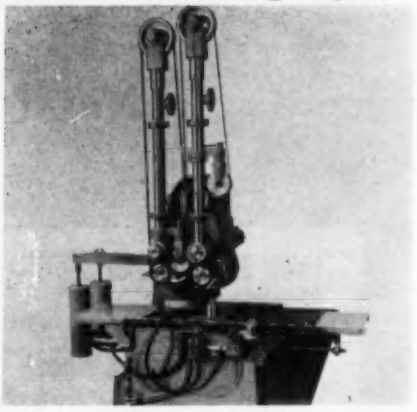
Using a hollow draw tube permits the passage of work, coolant, or tools through the spindle.

Model 26A can be used on grinders or similar machines with any holding device which requires a pull-back action to operate it.

PowerGrip, Inc., Main Street, Rockfall, Connecticut.

Use postpaid card. Circle No. 44

Belt Grinder Roughs, Finishes Contour Parts in Single Cycle



The recently-introduced Loungway rise and fall abrasive belt grinder is said to be the first to rough grind and finish contour and form parts in one cycle, in seconds, automatically.

The machine comes with single or double-spindle assemblies, with the latter giving the greatest versatility and speed. Other variations can be quickly adapted for handling special contours.

The double-spindle Loungway grinder allows two rough grindings and one finish grind in a cycle. Maximum workpiece size is 4" x 6" long, and small pieces may be ganged for multiple grinding by using a workholding jig. The workpieces travel on a table operated by air motor and hydraulic check units, and a special cam enables speed indexing to each grinding position. A cam follower on the spindle assembly follows the rise and fall cam attached to the workholding fixture, which enables fast change over on jobs. The speed of each spindle is adjustable by using different drive pulleys, so proper speed can be set for grinding, finishing or buffing. A counterbalance assembly allows rapid adjustment on belt pressure.

The Loungway grinder has several unique features that are said to aid both quality and production. There is a floating piston for even pressure on abrasive belts; a quick-change feature enables the changing of belts in seconds; special adjustments for belt alignment and tracking; and a unique cam operating air powered speed indexing of the table.

Eastern Machine Screw Corporation, 60 Barclay Street, New Haven 6, Conn.

Use postpaid card. Circle No. 45

BREAK THE "PROFIT SQUEEZE" WITH BRIGHTBOY

New slants to save your time, cut your costs, improve your product quality

A NEW APPROACH TO BIGGER TIME SAVINGS

The unique, cost-saving action of multi-use Brightboy (abrasive and rubber, functioning simultaneously) produces a finish that often constitutes the final polish:

BURRING • CLEANING
FINISHING • POLISHING
frequently in one operation

THE REVOLUTIONARY NEW CONCEPT OF ABRASIVE APPLICATIONS
For working all metals, wood, glass, laminated materials, some plastics.

49 readily available Brightboy STOCK textures are JOB-MATCHED to your machine and manual operations for conventional and automation production. Aluminum Oxide and Silicon Carbide abrasive grains—grades extra fine to extra coarse—in soft, semi-firm, firm and tough rubber binders. *The only complete, comprehensive stock line of soft rubber abrasives.* In wheels, sticks, rods and blocks for machine and manual operations.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Street Newark 7, N.J.
America's Pioneer Manufacturer of Rubber-Bonded Abrasives

WELDON ROBERTS
Brightboy
RUBBER CUSHIONED ABRASIVES

Every shop needs this illuminating outline of
NEW & ADDITIONAL APPLICATIONS FOR ABRASIVES

THE NEW BRIGHTBOY CATALOG

★ Methods and applications
★ Machine speeds
★ Job-matched grains and textures
★ New, revised wheel sizes
★ Center hole specifications conforming to American Standard regulations

WRITE TODAY FOR YOUR COPY

Use postpaid card. Circle No. 245

Mist Spray Unit Claims Better Control of Coolants

Controlled mist spraying of machining coolants and drawing compounds is claimed to be easier and more dependable than ever with the new Unimist metering block and tank units. Simplified design of the new block incorporates an external stop for the "on-off" plunger that prevents accidental jamming.

New design also makes the unit readily adaptable to cam-operated, automatic control. Improved 2-gallon pressure tank has snap-type lid locks

for easy opening and closing and a positive seal.

Unimist spray units operate on low tank pressures—10 to 30 psi—with no excess, uncontrolled flow to annoy operators, foul up machines or waste compressed air.

Standard Uni-Mist unit has a 2-gallon tank with pressure regulator, gage and safety valve. Tank can be used with multiple metering blocks, or a large number of blocks can be operated from a central system.

Brass fittings, used throughout, and the plastic coating of the Unimist steel tank prevent rust and corrosion by any type of compound.

Unimist, Incorporated, 510 28th St., SW, Grand Rapids 9, Michigan.

Use postpaid card. Circle No. 46

Claim Savings for Expendable Diamond Dressing Tools

New savings and efficiencies in grinding wheel dressing costs are said to be possible by the use of a new NR series of "non-resettable" and expendable diamond dressing tools from Diamond Tool Research Co.

According to the manufacturer, only the finest single point diamonds are used in these tools, thus allowing for a maximum number of wheel dressings per tool.

The elimination of resetting and its expenses, lower initial costs, and inventory reduction (since DTR maintains large stocks of these tools) are other advantages listed.

NR tools come in a variety of shapes and diamond sizes for all type straight and form dressing tools. Used diamonds can be turned in for salvage value.

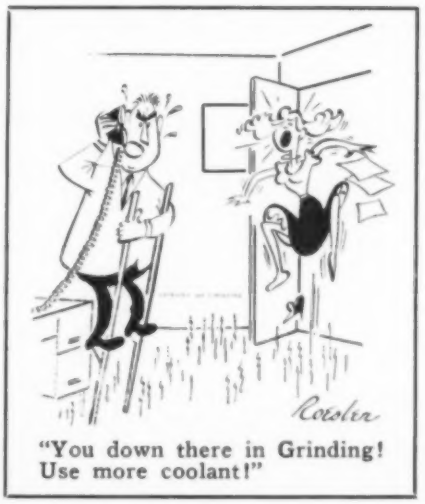
Diamond Tool Research Co., Inc., 380 Second Avenue, New York 10, N.Y.

Use postpaid card. Circle No. 47

Blasting Abrasive Designed for Middle Range in Price, Wear

A completely new blast cleaning abrasive designed to occupy a position between present malleable abrasives and steel both from the standpoint of performance and initial cost has been

continued



"You down there in Grinding! Use more coolant!"

Another case history on TORIT Dust Collectors

"THE GRIEVANCE COMMITTEE IS HERE ...ABOUT THAT DUST AGAIN!"

"This was the third time in a month that the grievance committee had complained about the dust in the shop. And this time they wanted to know what I intended to do about it.

"Frankly, I was on the spot. Oh, not that I blamed the workers. I knew the shop was dirty. How could it be anything else with grinding machines running 16 hours a day? And I was as unhappy about the situation as the employees were. Poor employee morale was serious enough—and absenteeism, machine wear, misalignment and down time caused by dust was costing plenty.

"Then I remembered a salesman with a dust collecting machine system had called on me a few months back. I dug his card out of the file and found he was from the Torit Company. I got him in pronto—and I bought one of his Model 90 Cabinet machines for less than $1,000. It services four surface grinders and it really performs. A month later I had Torit Dust Collectors installed for the rest of the machines.

"Torit Dust Collectors have practically eliminated the dust in our shop. And you can imagine the effect this has had on employee morale. People are happier and healthier. Absenteeism is no longer a problem and our production rate is higher than ever."

Cabinet Model 90

Torit can solve your dust problems. For complete facts on dust . . . and how to control it . . . write

TORIT manufacturing company

1133 Rankin St., St. Paul 16, Minn., Dept. 531

Use postpaid card. Circle No. 246

announced by Pangborn Corporation.

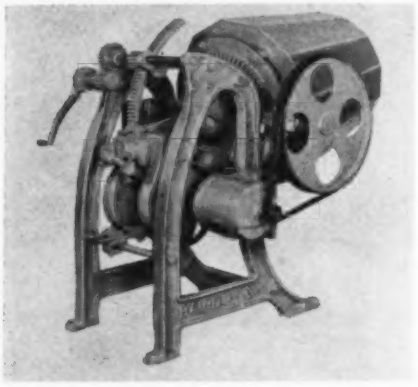
It is reported to last up to 2½ times longer than malleable abrasives although not as long as premium steel shot. Speed of cleaning is faster than the lower hardness malleables, the same as the harder malleable abrasives but less than steel of higher hardness.

Pangborn further stated there is a definite application and requirement for this new premium abrasive in the middle priced range and, when used under proper conditions, will offer new possibilities for reducing over-all abrasive costs.

Pangborn Corporation, 780 Pangborn Blvd., Hagerstown, Maryland.

Use postpaid card. Circle No. 48

Variable Speed Motor Adapts Barrel for Variety of Parts



A new variable speed motor is now being offered as an optional feature on The Baird Machine Company's Model C single oblique tilting tumbling machine. It is said to provide for the most efficient tumbling in relation to size and composition of work pieces, and type of abrasive media.

Baird's Model C tumbling machine is offered in two sizes. The No. 1, using a variable speed motor, has ½ horsepower and output speed of 1800-600 r.p.m. with a barrel speed range of 15-45 r.p.m. The No. 2 machine with a variable speed motor has 1 horsepower, output speed of 600-1800 r.p.m. and barrel speed range of 17-51 r.p.m.

Varying sizes of barrels can be mounted on the face plate of both machines. On the No. 1 tumbling machine, the barrels in size 13", 16" and 22" in diameter (across the bottom of the barrel) can be mounted. The No. 2 machine will accommodate barrels in 22", 28" and 36" diameter.

The Baird Machine Company, 1700 Stratford Avenue, Stratford, Conn.

Use postpaid card. Circle No. 49

For three score years and more...

. . . cost conscious buyers of production grinding wheels have been specifying "American" on their purchase orders knowing they would get wheels of uniform quality and performance . . . wheels that had been individually engineered to do their particular job more economically and efficiently . . . wheels that were exactly the same every time they were ordered regardless of shape — size — structure or quantity.

"American" offers wheels in every size and shape and for every purpose for which a grinding wheel is used. Every wheel is tested for true running qualities, strength and balance. Exact duplication is assured through the use of the most modern electronic and mechanical testing devices.

And "American" gives you a personal service by trained men . . . men who have dedicated themselves to the satisfactory solving of any and all production problems where grinding wheels are used.

There is an "American" man near you — call him or write for illustrated brochure to

"American" EMERY WHEEL WORKS

5 RED BRIDGE, PROVIDENCE 1, RHODE ISLAND

Use postpaid card. Circle No. 247

Dial Unit Stereomicroscope Aids Training Programs

A new training microscope, which permits both instructor and trainee to examine a specimen at exactly the same time, has been developed by Bausch & Lomb. Recently, stereomicroscopes have become widely used in industry, scientific and technological institutions, for routine analyses and inspection. The new instrument answers a widespread need for a quick, yet accurate means of training the new employee.

The components of the new unit include two standard, Bausch & Lomb StereoZoom microscopes and two accessories: a 0.5x lens attachment for greater working distance and vertical illuminator, which acts as a beam splitter so both viewers see the same field with equal clarity. The continuous range of power featured in all B&L StereoZoom microscopes, provides maximum balance of magnification. Each microscope can be used independently, or, in a matter of minutes, can be assembled into the teaching unit with common attachments.

The new dual instrument has several major advantages for laboratory and inspection areas. Both instructor and trainee can view the specimen or production part simultaneously, the trainee seeing specific detail the moment it is described. In addition, the new employee learns how to use the instrument

much more quickly and accurately, since the instructor can observe the trainee at work and correct errors immediately.

Bausch & Lomb, Inc., Scientific Instrument Department, Rochester 2, N.Y.

Use postpaid card. Circle No. 50

Claim Better Production, Finish for Variable Speed Buffing Hds.

New variable speed automatic polishing and buffing heads have now been introduced by Hammond Machinery Builders, Inc.

This innovation utilizes the dial control feature which earlier had also made Hammond first with variable speed polishing and buffing lathes.

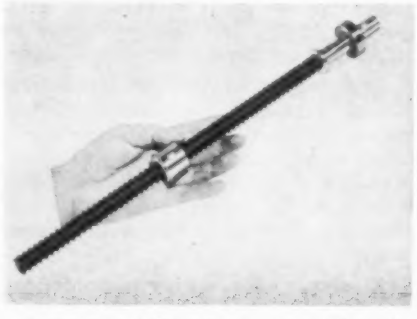
With the dial control, proper wheel speed can be selected while the head is running. Various speed ranges are available.

Variable speed automatic polishing and buffing heads provide numerous advantages: 1. Wheel economy—as wheel wear, speed is increased, giving maximum production and wheel life. 2. Increased production—the most efficient speed can be selected without stopping the head. 3. Better finish—different materials require the different speeds readily available with this feature. 4. Convenience—metal chart on the Dial Control indicates the right speed for each job.

Hammond Machinery Builders, Inc., 1651 Douglas Ave., Kalamazoo, Mich.

Use postpaid card. Circle No. 51

Anti-Friction Screw Gives Rapid Elevation or Traverse



A new anti-friction screw with only four threads per inch, from R. C. S.

EFFICIENT REMOVAL OF DUST AND CHIPS

• *SNAGGING* • *GRINDING* • *CHIPPING*
• *MACHINING* • *BUFFING* • *POLISHING*
and similar operations

Whatever your problem in industrial dust control, call on Kirk & Blum, an organization of engineers and mechanics with more than 50 years' experience in this specialized field.

You secure a complete service from Kirk & Blum . . . DESIGN, FABRICATION and INSTALLATION . . . with a single responsibility for an *efficient* dust control system.

For an analysis of your dust control problem, call on Kirk & Blum's expert engineering service. Write today for complete information and a K & B survey.

The Kirk & Blum Manufacturing Co.
3124 Forrer Street
Cincinnati 9, Ohio

KIRK & BLUM

DUST CONTROL SYSTEMS

Use postpaid card. Circle No. 248

Tool Company, is said to have pitch accuracy of .001" per inch of travel. Designed as a replacement screw in a Delta surface grinder for original equipment use, it will hold any elevated load such as a grinding head without slipping or counter-rotating according to the manufacturer.

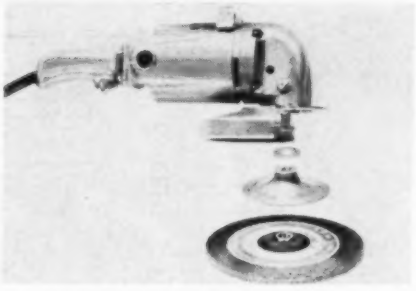
A non-recirculating ball screw assembly prevents counter-rotation of the screw. Four threads per inch permit more rapid positioning of the load and lessens operator fatigue, it is said.

Standard screws available from stock are 19" long, ¾" in diameter and are priced at $19.50.

R. C. S. Tool Company, 13681 Van Owen Street, Van Nuys, California.

Use postpaid card. Circle No. 52

Improved Mounting Lengthens Type 27 Wheel Life



Faster metal removal, longer wheel life and faster mounting and dismounting are among the advantages claimed for a new Type 27 raised-hub grinding wheel from A. P. de Sanno & Son, Inc.

These operating advantages are the result of the new mounting arrangement, which consists of a redesigned adapter flange and a threaded steel insert, which is molded as an integral part of the wheel. The new adapter flange, which slips on without threads, is made of heavy gauge steel rather than a soft, brittle die casting. It has a hardened and ground spindle sleeve for accuracy and long life. Because the wheel has integral threads and is backed up by an accurate adapter-flange, it always mounts at a true 90 degrees to the spindle, and runs true.

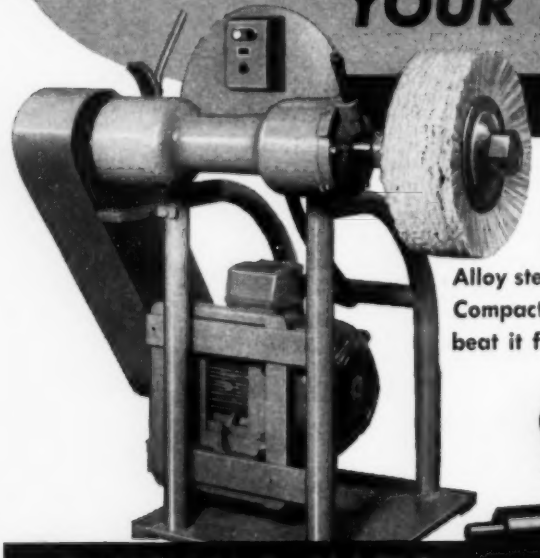
Mounting and dismounting is simpler. To install a wheel, the operator merely slips the adapter flange onto the spindle nose and spins the wheel on. Wheels are also removed by hand, without tools. There are no loose wrenches or nuts to misplace, no damaged nuts to reuse, and no hammers and punches needed to loosen bound nuts.

The new mounting is available with wheels of the same gradings and formulations as the conventional Radiac Type 27 raised-hub wheels. Standard diameters are 7 and 9-in. Standard thicknesses are 1/8, 3/16, 1/4, and 3/8-in. Arbor size is 5/8"-11. Other size wheels or nuts are available on special order. Maximum operating speeds are 7,700 rpm for the 7" diameter wheel and 6,000 rpm for the 9" wheel.

A. P. de Sanno & Son, Inc., 422 Wheatland St., Phoenixville, Pa.

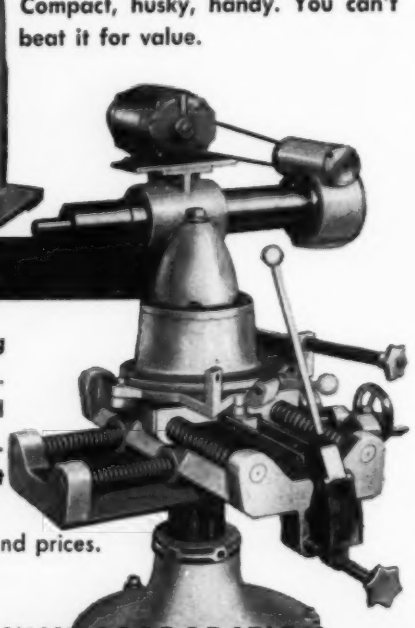
Use postpaid card. Circle No. 53

TWO, LOW COST MONEY MAKERS FOR YOUR SHOP!



THE ECONO-LATHE

All the essentials, none of the frills. A top quality, low cost production tool. Alloy steel spindle, quality bearings. Compact, husky, handy. You can't beat it for value.



THE HAN-D-MATIC

The most versatile buffing-grinding equipment since the human hand. Can handle 95% of your jobs. All standard interchangeable parts. Gives you more and better work at lower cost.

Write for literature and prices.

MURRAY WAY

MURRAY-WAY CORPORATION
P.O. BOX 180 • MAPLE RD. EAST
BIRMINGHAM, MICH.

Use postpaid card. Circle No. 249

Versatility Features Low-Cost Portable Belt Grinder

A low-cost, portable abrasive belt machine for light grinding and finishing of wood, plastic, and metal has been developed by The Rofran Co.

Called the "Pee-Wee" because of its small size, the sander deburrs, removes seams, and polishes small parts fast and economically. Designed for light industry and home use, it affords clean cuts on many types of surfaces, curves, scrolls, and inside edges with minimum equipment, time and effort.

Designed to grind both inside and outside surfaces, the "Pee-Wee" does either operation by a simple rearrangement of the pulleys and coated abrasive belt. The machine uses an abrasive belt 1 x 42 in. for polishing inside contours; 1 x 48 in. for conventional work.

Always under spring tension, the abrasive belt runs cool and smoothly at its operating speed, 2100 sfpm. A precision adjustment on the top idler

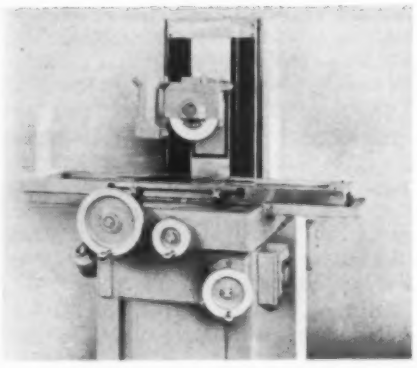
pulley provides perfect belt tracking. The belt is easily changed.

A metal platen, 1 in. wide, 2¾ in. high, backs up the abrasive belt. Held securely by two screws, this flat backstop can be removed quickly for free belt grinding or be replaced easily with a shaped platen for angular polishing. A calibrated protractor on the side of the sander simplifies set-ups for grinding beveled, curved, or straight edges.

The Rofran Company, 107 Chandler Avenue, Linden, New Jersey.

Use postpaid card. Circle No. 54

Surface Grinder Uses 78 Rollers for Easy Table Traverse



A total of 78 precision rolls support the table and work on the new Reid Brothers hand operated 618-HR Rollerway surface grinder. With rolls spaced for minimum wear on the ways and separated by non-metallic retainers, the machine is said to have one of the easiest moving hand operated tables on the market today.

The model is equipped with a table locking device to assure stability during the dressing of the wheel.

A variable tensioning device compensates for those jobs for which the table might move too freely. To ease operation further, adjustable spring loaded bumpers are provided to contact the stop dog at table reversal.

Reid Brothers Company, Inc., 140 Elliott Street, Beverly, Massachusetts.

Use postpaid card. Circle No. 55

continued

"Turns out more work than any other two men in the shop."

Now you can settle out large particles from your mineral-type oil or water-soluble coolants—with new efficiency and economy. You get greater mileage from every gallon of coolant, increase tool life, and improve work quality.

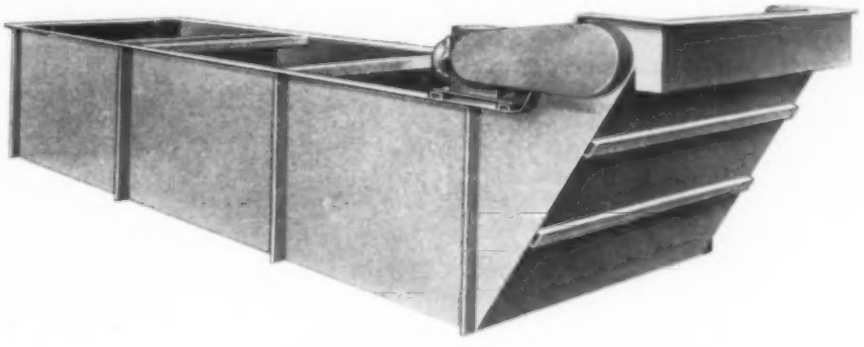
Olson's all-new Conveyorized Settling System makes the settling operation 70-90% efficient, depending on the viscosity of the coolant and size, weight, and nature of the contaminating particles. Operation is automatic from the start to the point of dropping sludge into the sludge disposal container. The system entails no servicing, such as adjusting or changing a filter medium. Only occasional emptying of the sludge pan is required.

The conveyor ramp can be built to extend upward to discharge at any height above floor level. Conveyor flights, chain and sprockets are made extra sturdy to handle the heaviest sludge load conceivable in a settling operation.

The Olson Conveyorized Settling System is available in tank sizes with holding capacities of 250 to 5000 gallons to suit your needs—whether applied to individual machines or central systems. For complete information, mail the coupon today.

ALL NEW

FROM OLSON



CONVEYORIZED

SETTLING SYSTEM

OLSON FILTRATION ENGINEERS *American Laundry Machinery Industries Division of McGraw-Edison Company, Cincinnati 12, Ohio*

OL-16-G

Send complete information on the all-new Olson Conveyorized Settling System.

*Name*_____

*Firm Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

Use postpaid card. Circle No. 250

New Transistorized Instrument Checks Thickness Ultrasonically

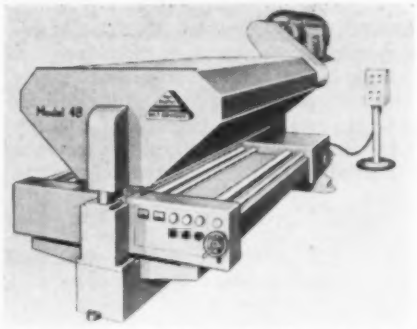
A completely transistorized battery-operated ultrasonic instrument for measuring wall thickness between .025" and 2.50" has been added to the broad line of test systems available from Magnaflux Corporation. The portable unit, designated Sonizon SO-300, gives instantaneous reading by simply placing a transducer on the surface to be measured, and turning a dial.

The SO-300 is housed in a specially engineered high impact-proof plastic case which measures 8½" x 9½" x 11¼". A separate carrying case for batteries is equipped with shoulder straps for use outdoors. The unit measures with an accuracy of ±1% when calibration is checked during tests against known sample of the same material.

Magnaflux Corporation, a Subsidiary of General Mills, 7300 West Lawrence Avenue, Chicago 31, Illinois.

Use postpaid card. Circle No. 56

Oscillating Belt Grinder Handles Varied Operations



Rough and finish grinding, cleaning and upgrading, graining, polishing and buffing on work up to 48" wide are all said to be accomplished easily on the new series of Tri-Matic oscillating belt grinders being introduced by Sales Service Mfg. Co. of St. Paul, Minnesota.

The new series in 24", 36" and 48" sizes differs from the smaller Tri-Matic machines which are knee type, in having a solid base and a workhead adjustable from 0 to 6" work opening with pinch roll infeed and outfeed instead of a conveyor. Fixtured conveyors may also be arranged.

Positive control of belt oscillation, belt tension, work pressure, feed and speed, that are said to provide an abrasive belt grinder capable of close tolerance work, are incorporated in the new machines with additional refinements. These include a load meter gauge for accurate control and resetting; a dial indicator for accurate workhead control and others.

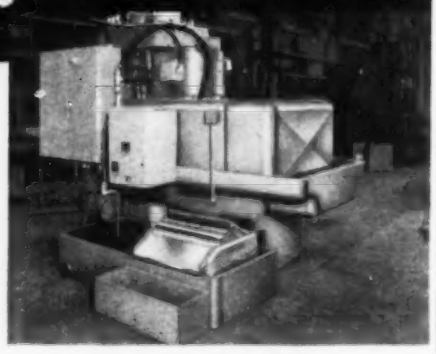
The outboard end is supported by an air operated plunger and collet which holds the workhead rigidly in position. When the belt tension is released the plunger automatically retracts to permit the abrasive belt to be slipped in and out in seconds. There are no guides, guards or projecting parts to be removed and replaced.

The basic machines are said to be unusually versatile because of the ease with which feeds, speeds, abrasive belts and other variables can be changed for different operations. On the other hand the machines are easily engineered for single applications at relatively low cost.

Sales Service Mfg. Co., 2363 University Ave., St. Paul 14, Minnesota.

Use postpaid card. Circle No. 57

432 MILLION GALLONS of CLEAN COOLANT PER DAY!



● That, roughly, is the potential capacity of the over 10,000 successful BarnesdriL Magnetic Coolant Separators, Filters, and Kleenall Filter-Separator installations now in use. Contaminated coolant on your grinding, honing, broaching, gear shaving, and/or polishing operations may be causing excessive rejects . . . unnecessary wheel dressings . . . poor finish control . . . increased machine wear . . . frequent waste of coolant that could be reclaimed. BarnesdriL coolant cleaning units pay for themselves in a short time. There's a model just right for your shop — capacities range from 1½ to 120 GPM. Write for free literature, or ask to have a BarnesdriL representative call!

BARNESDRIL FILTRATION UNITS

Send for new catalogs today!

Just off the press! Catalogs 100A and 300D covering BarnesdriL coolant cleaning equipment.

BARNES DRILL CO.
886 CHESTNUT STREET
ROCKFORD, ILLINOIS
Detroit Area Office—13121 Puritan Avenue

Use postpaid card. Circle No. 251

Two New Models Complement Safety Spectacle Line

No. 471 "Adapta-Spec" features clear safety lens, spatula temples and partial

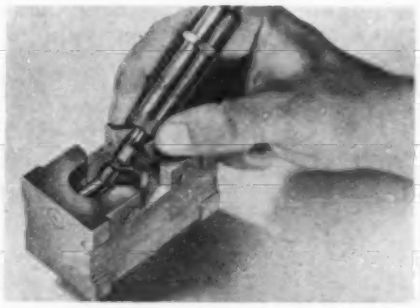
side shield. The No. 479 has green safety lens, cable temples and perforated side shields.

Made of durable butyrate plastic, the unique "Adapta-Spec" frame and bridge fit the facial contour of more than 95% of wearers.

American Industrial Safety Equipment Co., 3500 Lakeside Avenue, Cleveland 14, Ohio.

Use postpaid card. Circle No. 58

Redesigned Air Tool for Greater Strength



Bigger bearings and larger rotor shaft are two of the construction improvements made by Buckeye Tools Corporation in the 14G-800 Series Mini-Grinder, a small air tool for precise grinding.

The one-piece steel motor housing and ring throttle is said to provide greater strength and durability to match the 33% increase in rotor shaft diameter and a 25% increase in bearing size over the previous model. 1/8" and 3/32" collets have been simplified in design while the exhaust system has been refined by adding a built-in muffler.

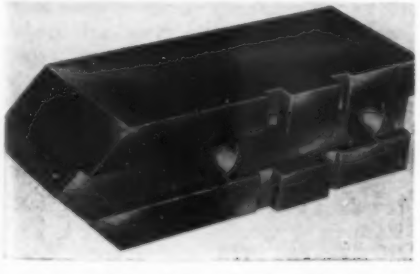
Despite these changes, the Mini-Grinder weighs only 5 oz., measures 13/16" D. by 3-7/8" long with a 13/32" offset.

Ring throttle provides infinite speed control over the vane-type air motor's 0 to 50,000 RPM range. Rated capacity of the tool is ½" mounted points, with peak efficiency at 90-100 working PSI through ⅛" ID hose.

Buckeye Tools Corp., 503 Springboro Pike, Dayton 1, Ohio.

Use postpaid card. Circle No. 59

Complete Line of Soft Blank Top Jaws Announced



A complete line of soft blank top jaws in sizes and shapes for all chucks made to American Standards has been

You always finish ahead with

STAR DUST DIAMOND WHEELS

Whatever your job requirements... precision grinding, cutting or finishing, there's a Star Dust Diamond Wheel to help you reduce costs for time and materials. Star Dust Diamond Wheels cut freer and faster because of newly improved bonding techniques and rigid quality control in selection and grading of diamonds, both natural and man made.

Get all the facts on Ace Abrasive Laboratories' line of resinoid and metal bond Star Dust Diamond Wheels and Diamond Abrasive Products. Write or call for free catalog "E" today.

ACE ABRASIVE LABORATORIES, Inc.

Ploneer 6-3347
35 Roselle St.,
Mineola, L.I., N.Y.

Use postpaid card. Circle No. 252

announced by The Skinner Chuck Company.

Included in the line are medium- and heavy-duty types in standard, extra-high and long pointed jaw construction for tongue and groove mounting. In the medium-duty line, top jaws for chucks 18" and larger are interchangeable with the heavy-duty type.

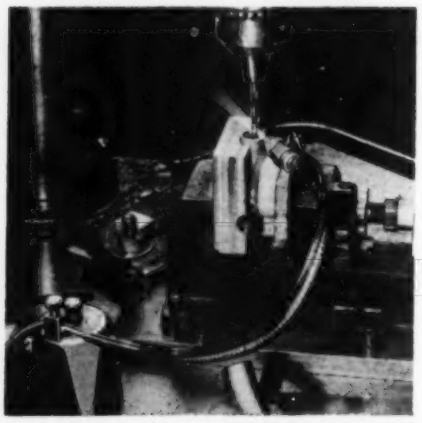
Skinner also offers soft blank top jaws and master keys for mounting on serrated master jaws—for heavy-duty power and scroll chucks.

The top jaws can be used as supplied or shaped to meet specific requirements. They are manufactured from low carbon steel which can be easily carburized and hardened. All soft blank top jaws are furnished in black, and are processed to resist rust. Hardening instructions are included with the jaws.

The Skinner Chuck Company, Department TJ-59, New Britain, Conn.

Use postpaid card. Circle No. 60

Mist Cooling System Boasts Easy Set-up, Quick Transfer



A new mist coolant system, including the Magnatrac adjustable air valve, is now available for toolrooms and grinding shops.

The unit, it is claimed, is easy to set up in the most workable position; it can be transferred from one machine to another in a matter of minutes.

Further, according to the manufacturer, it uses a minimum amount of coolant, requires no drains. There is no installation cost.

Future Products, Inc., Indianapolis, Indiana.

Use postpaid card. Circle No. 61

Portable Sandblaster Operates Like Production Spray Gun

The "Handi-Blast" portable sandblaster is said by the maker to require no more air than a production spray gun. It is also claimed that this is the only completely portable sandblaster.

The over-all height of the unit is 23"; tank diameter, 7"; unit weight, 23 lb. empty. Abrasive capacity is 30 lb. of sand.

Air is consumed at a rate of approximately 8 cu. ft. per minute, using a 3/32" nozzle and air supply from a 2 hp compressor. With a 5/32" nozzle consumption is 20 cfpm, and a 5 hp compressor is required for satisfactory operation.

The unit operates with abrasives between 20 and 100 mesh.

Handi-Blast Division, Hamill Manufacturing Company, Inc., Washington, Michigan.

Use postpaid card. Circle No. 62

Le Count Introduces Series of Compact Precision Mandrels

Like the compact car, the new LeCount "Compact" mandrels are more economical than the standard models because they are shorter and lighter but have the same **wide** expansion as their Type "B" **long** straight jaw mandrels.

The new Compact mandrels are built with the same high precision as the standard LeCount lines, and are offered in their Type "C" .0005" TIR, Type "SC" .0002" TIR and Type "CMC" .0001" TIR.

The line consists of 14 mandrels ranging from 3/8" to 3¼" and with jaw

SPITFIRE
1 2 3 basic reasons Lapping is now a standard
Illustrated: the Spitfire 36" Pneumatic Lift Flat Lapping Machine
1. PROVED: Spitfire Lapping Machines have been in continuous operation for approximately two decades in almost every phase of industry... built-in quality and precision, experienced engineering assure demanded reliability.
2. NEED: Quality control requirements for lapping to thousandths of an inch precision has become increasingly necessary. Literally any piece part produced of any material is quickly, accurately, economically lapped and/or finished in small or high volume production with Spitfire machines.
3. COMPLETE LINE: from small bench type 6" roller lapping machines to 48" pneumatic flat lapping machines.
Write for free Spitfire Catalog.
SPITFIRE
TOOL & MACHINE CO.
2931 N. Pulaski Rd.
Chicago 41, Illinois
Phone: AVenue 6-1610
Use postpaid card. Circle No. 253

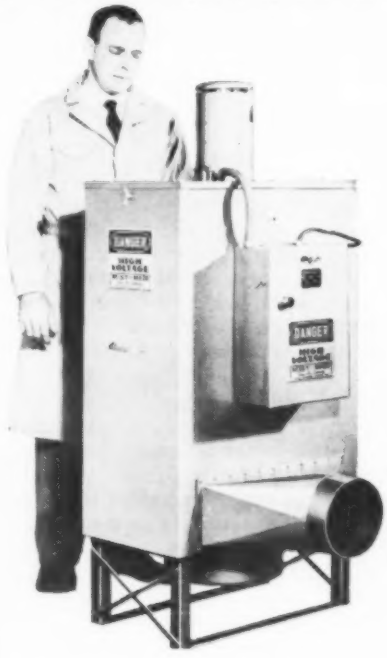
bearings ranging from 1" on the smallest to 2½" on the largest.

Each Compact mandrel shipped carries LeCount's guaranteed precision certificate giving in tenths the exact concentricity of the mandrel throughout its entire range.

LeCount Tool Works, Inc., 38 Cody Street, West Hartford 10, Connecticut.

Use postpaid card. Circle No. 63

New Electronic Precipitator Eliminates Shop Mist, Fumes



A compact, self-contained oil mist and fume precipitator for removal of objectionable pollution from shop air has been announced by the Air-Maze Corporation of Cleveland.

The new development, Misti-Maze electronic mist precipitator, is said to remove oil mist, smoke, and fumes from air exhausted from machine tools and welding booths.

Coolant collected from machine tool operations can be returned to the machines for re-use. Air from the unit is re-circulated to the shop, cutting heating and air conditioning costs.

The Misti-Maze unit is available in two sizes—one rated at 600 cu. ft. per minute and the other at 1200 efpm.

The Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio.

Use postpaid card. Circle No. 64

Power Chuck Operates with Air or Hydraulic Cylinder

A new power chuck operated either by air or hydraulic cylinder is designed to provide the advantages of hand-operated chucks plus the controlled holding pressure and ease of operation which only power chucks provide.

Principal features claimed for the new chuck are:

A center hole up to 4" I. D., for chucking bars and long thin work pieces.

Serrated jaws easily adjusted to grip a variety of diameters.

Greater gripping power from the 8-to-1 lever ration in the chuck.

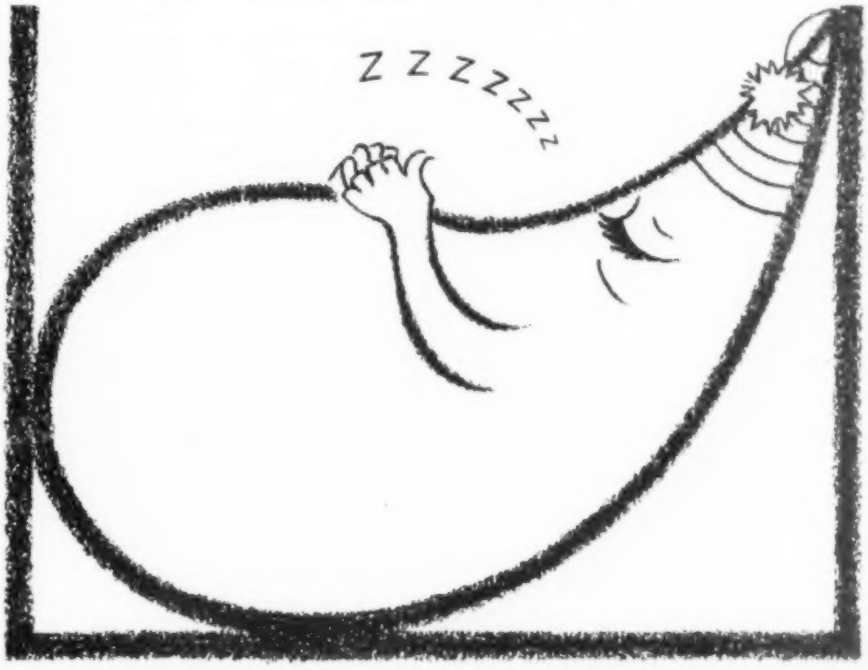
Safer operation. The jaws will not open in case of power failure.

The new chuck is available in 7 standard sizes from 4¼" to 16", in both 2-jaw and 3-jaw styles, and with seats to mount directly on the spindle of most popular lathes.

PowerGrip, Inc., Rockfall, Conn.

Use postpaid card. Circle No. 65

"There must be *something* in the rules about abrasive gloves."



Are you the victim of a lazy coolant?

Does your grinding coolant or oil just seem to lie there — making the rounds from tank to work — but without helping the wheel cut — without improving the work finish?

Is it sloppy about tolerances, chip-settling or rust? Does it smell bad?

If so, switch to a White & Bagley *lively* coolant! There's not a lazy molecule in a drumful!

W&B Chemical Concentrates — For very keen grinding action at very low cost.

W&B 1500 — for steel (and titanium)

W&B E-55 — for steel cast iron, nonferrous metals.

W&B Lubricant 1888 — High-detergent oil-type soluble for better finishes, tolerances, on grinding *and* cutting.

W&B HD Soluble 2213 — Best combination of support and cooling for tough grinding and cutting jobs.

W&B Grinding Oil 1572 — Standard of the industry for extremely critical thread, gear, tap and form grinding.

W-B INDUSTRIAL LUBRICANTS

To get the facts about *lively* coolants, write The White & Bagley Co., 88 Foster St., Worcester, Mass.

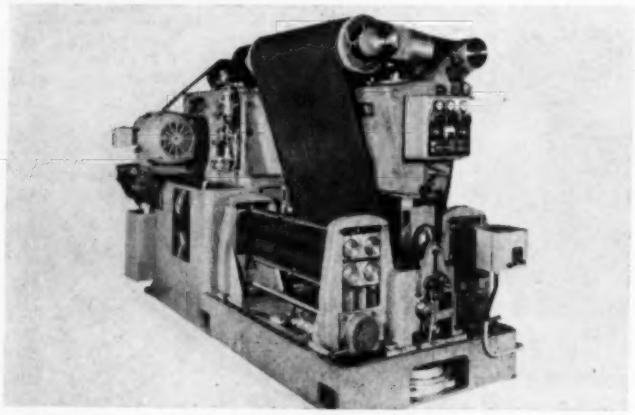
THE WHITE & BAGLEY CO.

Worcester, Massachusetts · Detroit, Michigan

Originators of Grinding Lubricants

Use postpaid card. Circle No. 254

New Mattison "Compact" Abrasive Belt Grinder Has Three-Roll Head



Size control, fine finish, and high production all are combined in a new three-roll abrasive belt grinding and polishing machine announced by Mattison Machine Works.

The grinder is designed to provide compactness needed today for in-line installations (such as for coil grinding) without loss of rigidity, cutting qualities, or power needed for production of accurate, fine-finish work.

Each of three rolls in the grinding head helps the No. 457 combine high productivity and precision. Proper hardness and serration of the contact roll supplies the grinding or polishing action, another roll aligns and flexes the belt, and a third roll drives the belt, pulling it between the work and the contact roll. This design imparts a smooth surface finish, which is free of motor pulsations and chatter marks.

Up to 150 hp on the belt drive achieves positive grain penetration and increases accuracy. The tensioned cast Meehanite main support arm assures positive close grinding control with no vibration.

Grinding contact is established within only ¼" of a sheet's lead end. A photoelectric cell senses the leading edge of a sheet as it enters through the feed rolls. The electric eye pickup actuates a control mechanism which raises the billy roll and brings the sheet into contact with the abrasive belt. Uniform grinding pressure is maintained to within ¼" of the trailing edge of the sheet. This design permits optimum grinding contact, yet prevents either end of a sheet from cutting into the abrasive belt, making a mark that would be transferred when grinding the next sheet.

The new three-roll head, including rolls, belt, tracking and tensioning devices, and electronic timer, is designed as a unit. The versatile package can be used on pinch roll machines, reciprocating table machines, conveyor-type applications, and way and column combinations. The design also adapts to both wet and dry grinding, with large windowed doors allowing easy access to all functional parts.

An important production advantage of the new grinder is its ability to accurately grind a wide variety of work requiring critical thickness tolerances. Abrasive belt grinders have proved exceptionally efficient while grinding, polishing, and sizing honeycomb, sheet stock, chip board and other flat wood products, glass, and high-production small flat work such as motor laminations.

Belt widths are 36, 48, 60, and 72 inches. All operating controls are located at the front of the machine within easy reach of the operator. A load ammeter indicates the amount of grinding load, permitting the operator to determine the point of best grinding efficiency, and to maintain this point by adjusting pressure on the billy roll to proper power consumption.

Mattison Machine Works, 545 Blackhawk Park Avenue, Rockford, Illinois.

Use postpaid card. Circle No. 66

TESTS *with* CLOVER LAPPING COMPOUND

Machine lapping is always important —no one uses the process unless it is. And, as makers of the first commercial abrasive compound, Clover knows that the kind of lapping compound you use can make a vast difference in efficiency as well as in finish.

Only testing can prove out the best combination of lap speed, grain, vehicle and pressure. But one thing is sure: you might as well have Clover's 50 years of tests behind you when you start your own.

Check with Clover on lapping and grinding problems. The hardest lapping jobs often respond to an answer that was worked out for something entirely different. Use Clover's experience for a starter — *write for suggestions and samples.*

Clover Manufacturing Company

Norwalk, Connecticut

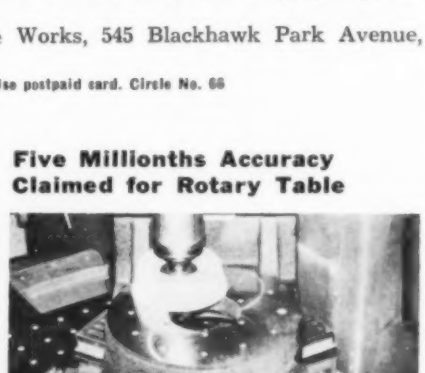
Victor 7-4515

Since 1903

We also make **CLOVER COATED ABRASIVES**

Use postpaid card. Circle No. 255

Five Millionths Accuracy Claimed for Rotary Table



New "Ultraron" rotary table is said to have runout and parallelism accuracy of 5 millionths of an inch. Applications include grinding and lapping operations where concentrictiy, squareness and parallelism are vital.

Matching precision races are ground in the base and the top plate. Balls—identical in diameter and round within 2 to 3 millionths of an inch—are equally spaced in the lower race and held in place by a special retainer. The top plate is supported by the balls.

A bronze center bushing secures the assembly and a recessed cover plate seals the interior against dust, dirt and liquids.

The 17-inch-diameter Ultraron illustrated has a height of 4½ inches. It

weighs about 300 pounds but can support a 1000-pound load. Other table sizes, from 6 to 96 inches in diameter, and motorizing equipment are available on special order.

AA Gage Company, 350 Fair St., Detroit 20, Mich.

Use postpaid card. Circle No. 67

Spindle Reduces Bearing Errors

A new design of the "Zero Spindle" (N. A. Woodworth) is claimed to eliminate conventional bearing errors and to guarantee near-zero eccentricity.

The "Zero-Spindle" block assembly design incorporates a cast bearing block which permits the addition of a small base and tray top for indicator mount assemblies. The journal adjustment feature has been changed to a single screw running parallel with the spindle. A larger wheel and knob assure ease of operation.

"Zero-Spindle" bearing block assemblies are available from stock. Concentricity is guaranteed to .0001 T.I.R. Specials are available for closer concentricity requirements.

N. A. Woodworth Company, 1300 East Nine Mile Road, Detroit 20, Michigan.

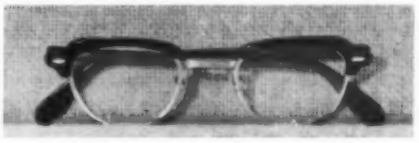
Use postpaid card. Circle No. 68

Safety Eyewear Combines Protection, Good Looks

New Sightgard safety eyewear combines maximum protection with the distinctive appearance of modern functional glasses, according to Mine Safety Appliances Company, the manufacturer.

"A little snug, eh? Well, we can fix that in a jiffy."

Sightgard eyewear is designed for a wide variety of industrial applications,



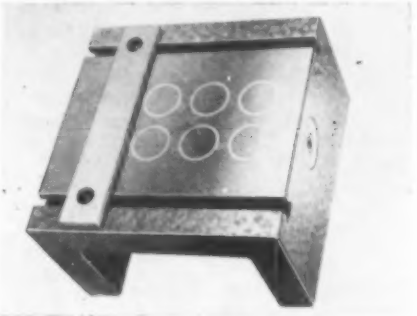
providing high optical quality and impact strength in excess of specifications.

To meet individual needs and preferences, Sightgard eyewear is available in metal and acetate frames, various temple styles, and rigid and adjustable nose pads. Custom fitting is possible through a complete range of lenses, bridges, and temple sizes. Side shields are available with the flesh and ebony acetate models. Also featured is a universal bridge designed to simplify stocking and fitting problems.

Mine Safety Appliances Company, 201 North Braddock Avenue, Pittsburgh 8, Pennsylvania.

Use postpaid card. Circle No. 69

Magnetic Sine Plate Holds Ferrous Metals Without Clamps



A new magnetic angle plate, developed by Bald Eagle Products Company, permits inspection and layout of any ferrous metal, without use of clamps. Dimensions of the angle plate are 6" x 6" x 4", and the plate is guaranteed to be square within .0002".

An adjustable guide rail, supported in two T-slots, may be used as a reference or support and can be removed

GRIND...POLISH...DEBURR in one operation with Hammond FLAT FINISHERS

For fast, uniform, economical finishing of flat work such as sheets, bars, strips, stampings and extrusions with one machine, one operator and one pass.

AUTOMATIC AIR TENSIONING: maintains correct tension on abrasive belts and conveyor belt • **VARIABLE SPEED CONVEYOR:** rate of feed is adjustable from 0 to 60 FPM • **WORK HOLDERS:** hold-down rolls, electro-magnetic platen and various types of conveyor belts • **AMMETER CONTROL:** an ammeter for each head allows operator to determine and maintain the polishing pressure necessary for a uniform finish and longer belt life • **V-BELT DRIVE:** allows abrasive belt speed to be changed to suit the work • **MICROMETER DIAL:** controls heads for required depth of cut.

Write for literature today.

1 TO 6 HEADS 6" to 12" WIDE

Hammond Flat Finishers are available in 6", 8", 10" and 12" widths — handle work up to 6" high.

SEND SAMPLES
Send us one finished and several rough samples. You will receive a complete Engineering Report and Production Analysis without obligation.

Hammond Machinery Builders INC.
1651 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

Use postpaid card. Circle No. 256

completely. The permanent magnetic chuck, which does not create magnetic distortion, is activated by a key.

Bald Eagle Products Company, 60 East Fourth Street, St. Paul 1, Minn.

Use postpaid card. Circle No. 70

Set-Up System Offered in Smaller Version

A new and smaller version of the popular Clamp-N-Jack set-up system for machine tools is the new "B" series from the Universal Vise and Tool Company.

It is similar in design to the original "A" series. Since all components are smaller, it is suitable for clamping and jacking on medium and small machines.

Components consist of swivel bases and strap clamps that are assembled together to provide an infinitely adjustable support for the clamp. Also included are spacer tubes that allow for additional clamping heights when assembled with the swivel bases and spacer tubes.

The new "B" Series is available in complete sets or as individual components.

Universal Vise and Tool Company, 1960 Beaman Street, Parma, Michigan.

Use postpaid card. Circle No. 71

Adjustable Length Gage Simplifies Measurement

A new adjustable length gage developed by the Unigage Corp. makes possible rapid and accurate length inspection in manufacturing plants. Measurement of machined and ground parts such as shafts and spindles is greatly simplified.

The new gage is easy to set up for inspection work and may be mastered by use of gage blocks or a known size piece part. This feature eliminates the need for special gage masters. The bench mounted gage is adjustable for lengths from $\frac{5}{8}$" to 8" and for support on diameters from 1/16" to 1-1/4".

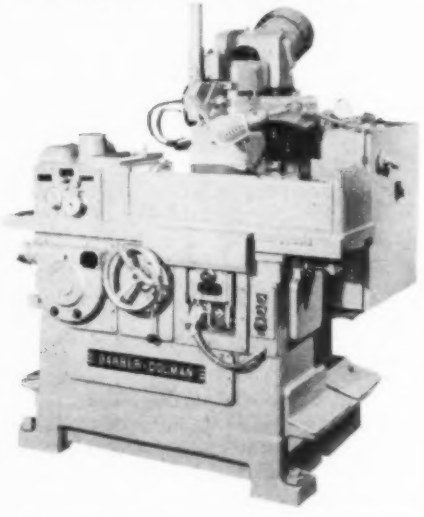
A few of the many measurements which can be taken are: over-all length, shoulder to end, shoulder to shoulder, and other combinations. Thread lead may be checked with the use of special contacts.

A sensitive reed transfer carries the measurement from the part being checked to the dial indicator. Either coarse or fine measurements may be made depending on the indicator model selected.

Unigage Corp., 330 Interstate Rd., Addison, Ill.

Use postpaid card. Circle No. 72

Automatic Dresser Reduces Tool Costs By Positive Control



A new automatic dresser reduces direct and indirect tool costs through improved control of sharpening operations performed by Barber-Colman Company's No. 6-5 hob sharpening machine.

Speed, accuracy, finish, wheel wear, diamond life—even spark out—are controlled automatically and continuously while sharpening hobs, thread mills, or form cutters on the No. 6-5. Operators never stop the machine to dress the wheel. One man easily can keep several machines busy without danger of burning or breaking teeth. Wheel loading and heat-checking are controlled for him.

The new hydraulically actuated dresser operates continuously as the wheel sharpens. The wheel feeds into the diamond a predetermined amount before each dressing cycle. Infinitely variable dresser arm speed permits any desired combination of sharpening speed and finish.

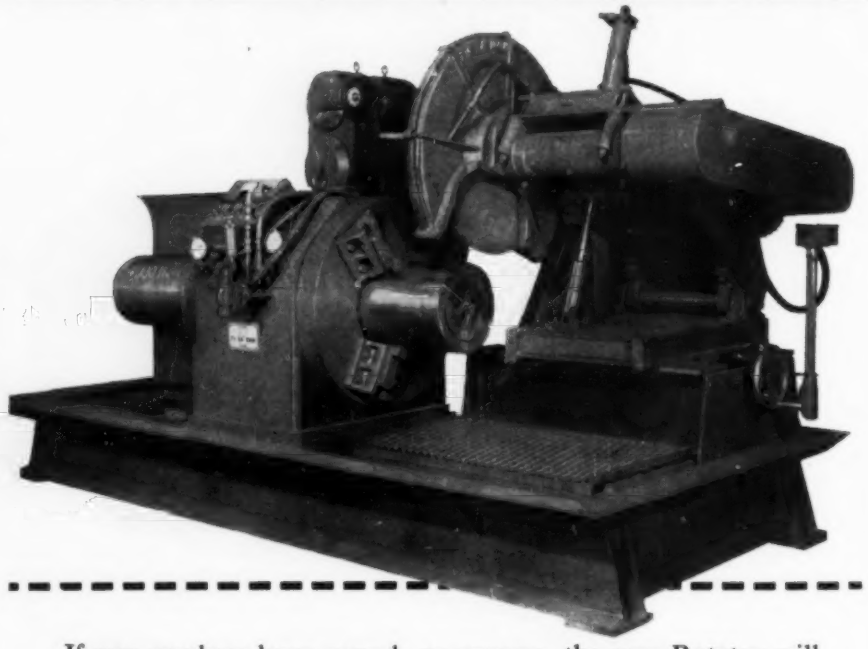
Direct savings result from maintaining original tool accuracy, maximum sharpening efficiency, and minimum stock removal.

Automatic dressing is now available on all Barber-Colman hob sharpening machines.

Barber-Colman Company, 593 Loomis Street, Rockford, Illinois.

Use postpaid card. Circle No. 73

NEW Abrasive Saw Rotates Metal . . . Cuts 16 to 20 IPM's on Hard Alloys



If you produce large rounds or squares, the new Rotator will reduce your cutting time to a minimum . . . 16 to 20 square inches per minute on hard alloys. It's the only rotator-type saw with a chuck that will hold rough forgings and rounds, as well as conventional rounds up to 14" diameter. Material is rotated as it is cut, keeping a cooler surface at the point of blade contact . . . result — longer blade life. Self-contained and portable, with integral tank and re-circulation pump.

Ty-Sa-Man
SINCE 1885

Write for FREE BULLETIN

TY-SA-MAN Machine Co., Inc.
1016 White Ave., Knoxville, Tenn.

Use postpaid card. Circle No. 257

Plastic Sheet Filter Ends Media Changes

AAF Foamat filter, a new unit air filter employing a single sheet of synthetic plastic material, has been added to the line of products manufactured by American Air Filter Co., Inc.

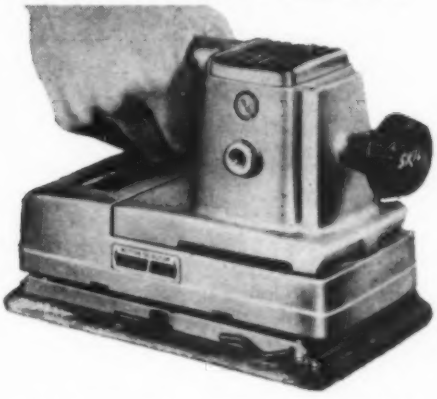
Sponge-like in appearance, Foamat breaks an air stream into little jets as it passes through the filter. Dust and dirt cannot follow and are trapped in great quantities by the cells. Designed as a permanent filter, Foamat is said not to pack, settle, separate or develop "thin" spots.

It completely eliminates media replacement and offers greatly reduced maintenance. It can be washed with a standard spray-head hose nozzle without removing the filter from the filter bank. Where stubborn process dusts are encountered the filters may be removed, soaked in a mild detergent, rinsed with cold water, and reset in place.

Dept. PD, American Air Filter Co., Inc., 215 Central Avenue, Louisville 8, Kentucky.

Use postpaid card. Circle No. 74

Heavy-Duty Sander Provides Orbital or Straight-Line Work



A heavy-duty orbital and straight line sander—Skil Model 692—is said by the maker to be the first of its kind in the electrical tool industry.

Either sanding action is selected by operating a convenient motion switch on the right side of the unit. No tools are required for changing the motion pattern or for replacing sandpaper.

The sanding surface measures 4½" x 9". Spring action levers hold six or more sheets for easy paper change. The flush side design permits sanding up to vertical surfaces or in corners.

Skil Corporation, 5033 Elston Avenue, Chicago 30, Illinois.

Use postpaid card. Circle No. 75

Two New Sets Added To Small Bore Gage Line

Diatest small bore gage set No. E-O, covering a range of .047" to .062", has been added to the line. The complete range covered by sets E-0, E-1, E-2, E-3, and E-4 is .047" to 1.130", with all sets overlapping in size to insure complete range. Now, also included in the line is the new set No. E-161 with a range of sizes of 1/16" to 3/8", in increments of 1/16".

Special measuring heads, EBF series, are available, designed for checking flush to the bottom of closed holes.

Reported accurate to .00008", these bores check out-of-round, tapers, incomplete bores and all other variations. All parts are obtained separately. Various accessories are offered for the gages.

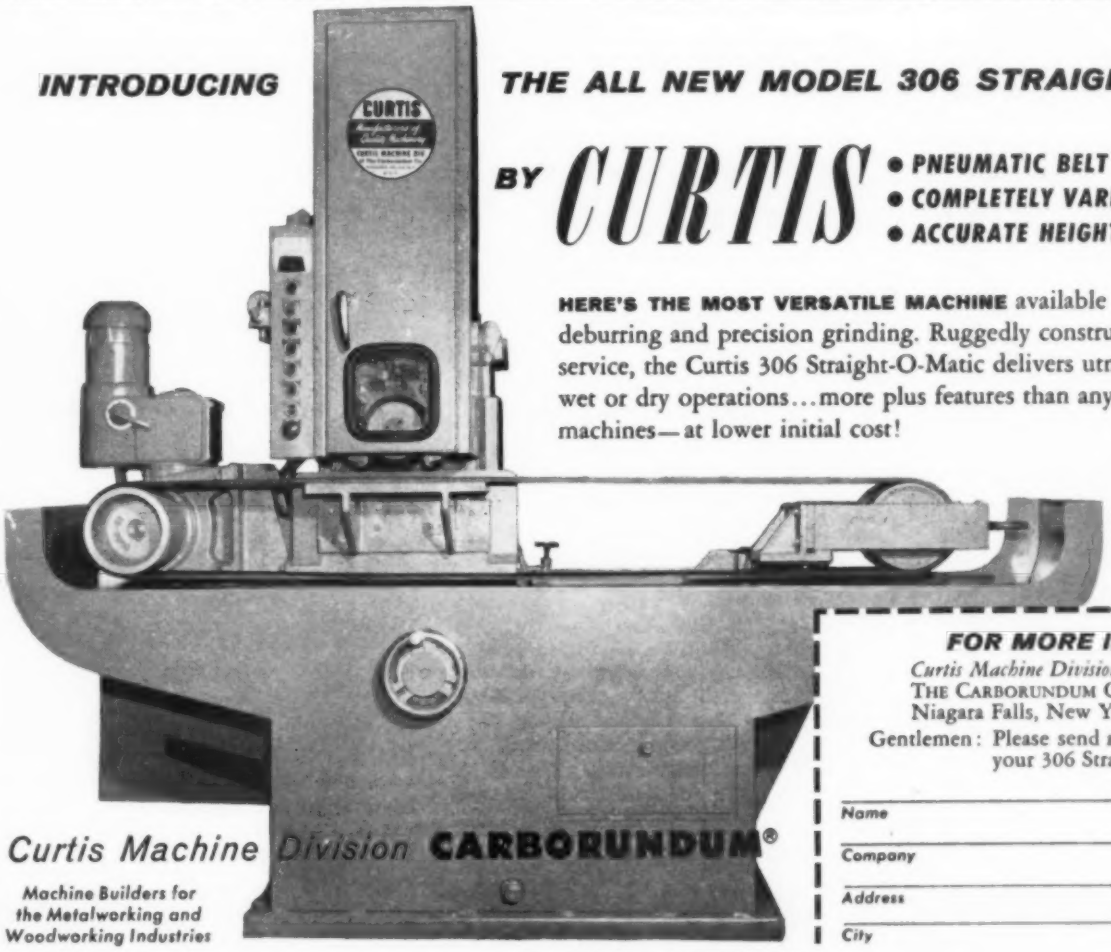
Foster Supplies Co., 6122 Milwaukee Ave., Chicago 46, Ill.

Use postpaid card. Circle No. 76

INTRODUCING THE ALL NEW MODEL 306 STRAIGHT-O-MATIC

BY CURTIS

- PNEUMATIC BELT TENSIONING
- COMPLETELY VARIABLE BELT SPEED
- ACCURATE HEIGHT ADJUSTMENT



HERE'S THE MOST VERSATILE MACHINE available today for polishing, deburring and precision grinding. Ruggedly constructed for long service, the Curtis 306 Straight-O-Matic delivers utmost precision on wet or dry operations...more plus features than any competitive machines—at lower initial cost!

Curtis Machine Division CARBORUNDUM®

Machine Builders for the Metalworking and Woodworking Industries

FOR MORE INFORMATION

Curtis Machine Division
THE CARBORUNDUM COMPANY, Dept. GF
Niagara Falls, New York

Gentlemen: Please send me more details on your 306 Straight-O-Matic.

Name

Company

Address

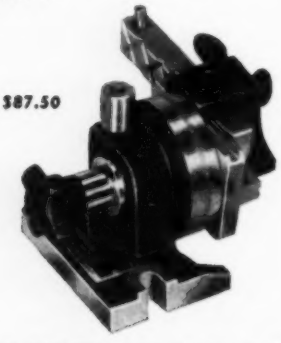
City Zone State

Use postpaid card. Circle No. 259

Angle Tangent to Radius WHEEL DRESSING *Simplified* WITH ROTHFUSS TOOLS

THE G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on all wheels up to 10" and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. ***Price $80.50***

Price $87.50



THE G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up jobs to be milled, drilled, tapped on any desired angle.

FREE STORAGE CASE of light-weight steel, with a hinged top, heavy duty latch and a blocked interior to insure the safety of the dressers when carried.

OUR FIXTURES will dress most radii and angles tangent each other, similar to those shown below.

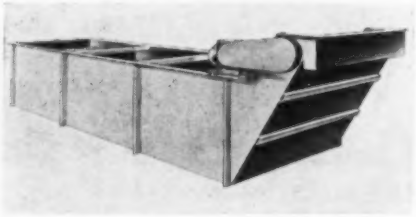
All for only $149.50 *(including case and both tools with diamonds)*

Distributorship available in select territories

ROTHFUSS TOOL COMPANY
BOX 2696 ELMWOOD STATION PROVIDENCE 7, R. I.

Use postpaid card. Circle No. 260

Conveyorized Coolant System Removes Large Particles



A new conveyorized settling system has been designed by Olson Filtration Engineers for settling out large particles from mineral-type oil or water-soluble coolants. It is available in a number of tank sizes with holding capacities of 1,000 gallons and upward.

With the new settling system, operation is reported to be 70-90% efficient, depending on the viscosity of the coolant and the size, weight, and nature of the contaminating particles. Operation is automatic from the start to the point of dropping sludge into the sludge disposal container.

The conveyor ramp can be built to extend upward to discharge at any height above floor level. Conveyor flights, chain and sprockets are made extra sturdy to handle the heaviest sludge load conceivable in a settling operation.

Olson Filtration Engineers, 5024 Section Avenue, Cincinnati 12, Ohio.

Use postpaid card. Circle No. 77

Table Converts Drill Press for Grinding, Other Operations

Grinding is only one of the operations which can be performed with the new Palmgren No. 500 drill press table installed on a drill press column. The table fits all popular size bench or floor model drill presses.

The unit provides two cross slide movements, together with 360° rotary feed and graduated tilting adjustment.

Table diameter is 8", graduated 360°. Top surface has two ⅝" x 1⅛" T slots which cross at the center. Transverse and longitudinal travel is 4¼". Cross feed dials are graduated in thousandths.

Rotary feed is positive with a worm gear ratio of 40:1. Rotary dial is calibrated in three-minute intervals. Column mounting bracket is also graduated in degrees for angular tilting adjustment.

The table assembly can be quickly and easily removed from the column mounting bracket. The base is machined and provided with bolt lugs for mounting on other machine tables.

Chicago Tool and Engineering Co., 8383 South Chicago Avenue, Chicago 17, Illinois.

Use postpaid card. Circle No. 78

Height Stand Reported Usable with Electronic Gage Heads

A new, general-purpose Height Stand, Model 2300, has sufficient accuracy and stability to be used with electronic gage heads as well as dial test indicators and permits measurements at heights up to 18".

Its contoured base measures 3" x 4⅜", has a three-point support to eliminate any chance of rocking, and is designed so that any heat transferred from the hand in no way affects the column support or its adjustment. Wide range fine-adjustment (up to .030") is located on the base, rather than on the arm as in most height stands, so that it can be operated without influencing the position of the gage head or indicator.

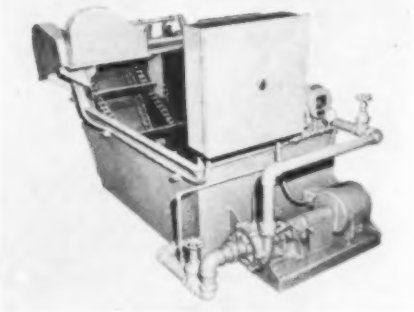
A split clamp with large knob secures the arm without need for auxiliary locking devices. The 7/32" diameter mounting post takes a regular universal clamp and is removable for substitution of scribe marker or other transfer device, if desired.

Model 2300 height stand is priced at $52.50 and is available from stock.

Federal Products Corporation, Providence 1, Rhode Island.

Use postpaid card. Circle No. 79

Automatic Suction Filter Designed for Grinding Coolant



A new self-cleaning, automatic suction filter for salvaging of grinding coolant is said to eliminate the need for paper or other replaceable media.

Dirty coolant is pumped through a screen into a clean compartment for re-use. Swarf, metal particles, dirt, etc.,

collects on top of the screen forming a filter mat which filters progressively to low micron particle size.

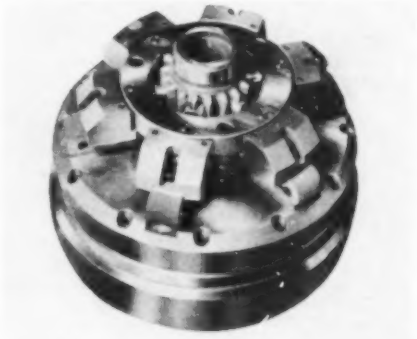
As the filter mat becomes deep enough to decrease the flow of filtered coolant, a switch is activated starting the conveyor. This moves the mat, clearing a portion of the screen and restoring the flow of filtered coolant to normal rate.

The new filter is available in capacities from 25 to 2,500 GPM. Machines can be tailored to specific needs, adapted to central systems and installed above or below floor level.

Henry Manufacturing Co., 519 E. Reed St., Bowling Green, Ohio.

Use postpaid card. Circle No. 80

Spring-Jaw Gear Chucks Designed for Accurate Holding



Outstanding feature claimed for a new line of Erickson gear chucks is unique design for accurate holding of the part from the pitch line of the gear. The chucks can be either air, drawbar, or manually operated.

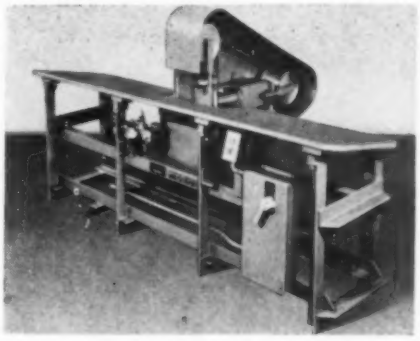
Great versatility of use is also claimed. Often, the same chuck, without any alteration, can handle pre-shave, pre-grind, finish-shaved or finish-ground gears because of the range of the unit's spring-jaw design. Jaws, cages, locating pins, and end-stops are all interchangeable.

Erickson Tool Company, 34350 Solon Road, Solon, Ohio.

Use postpaid card. Circle No. 81

"No, no, stupid! *That* is not lap grinding!"

Abrasive Belt Head Prolongs Belt Life



Greatly increased belt life is now available with this new abrasive belt head machine from Murray-Way Corporation.

The abrasive belt travels on a resilient driven back-up belt, which is supported at work position by a steel platen. This back-up belt, constructed of sturdy rubber and fabric, saves wear-and-tear on the abrasive belt by; (1) providing resilience for the cutting grain, and (2) giving it a moving support as it crosses the steel platen at work position.

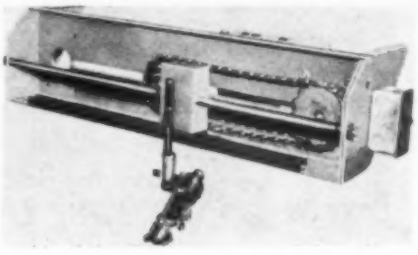
This photograph shows the abrasive belt head with safety hood cover removed. The large table-top may be used horizontally, or tilted to produce a chamfer or beveled edge on the work. In addition, it may be positioned so as to provide an angular surface in relation to a second surface.

Standard abrasive belts may be used with this new machine, and belts are easily removed and replaced when necessary. Size of work table varies with work specifications.

Murray-Way Corporation, P.O. Box 180, Birmingham, Michigan.

Use postpaid card. Circle No. 82

Automatic Liquid Applicator Designed for Wide Buffs



A new automatic applicator of liquid buffing and polishing compositions, the Stevens traveling gun mover, is designed for use with wide buffs where the application of a uniform spray of liquid compound is a problem.

The new Stevens gun mover is designed to improve liquid compound adherence. A simple, maintenance-free mechanism featuring a power drive chain and sprocket device, it permits a wide variation in width of travel and can be used with single or multiple buffing systems.

Metal Finishing Department, Frederic B. Stevens, Inc., 1800 18th Street, Detroit 16, Michigan.

Use postpaid card. Circle No. 83

SEND FOR CATALOG G

NAME
TITLE
COMPANY
STREET
CITY/STATE

DRESS
ABRASIVE BELTS
FOR 30%
LONGER LIFE

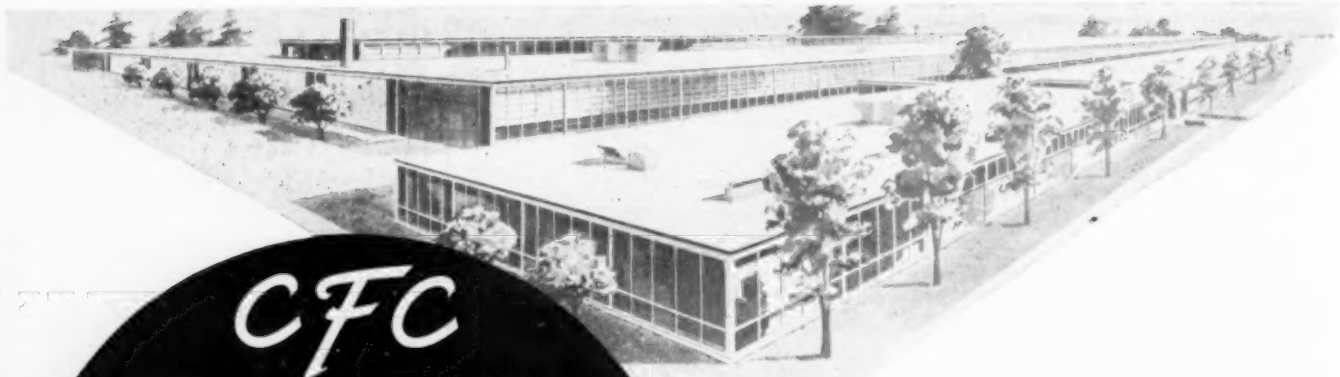
Unique Desmond Beltbrasive® dressers increase abrasive belt life 30% or more . . . give you "new" surface efficiency throughout belt life. Patented dresser quickly cleans out loaded belts, drums or discs on metal, wood or plastic jobs. One light pass when belt begins to load is all you need. Typical model costs less than $7. Ask your Desmond distributor.

The only complete line of grinding wheel dressers and cutters

Desmond

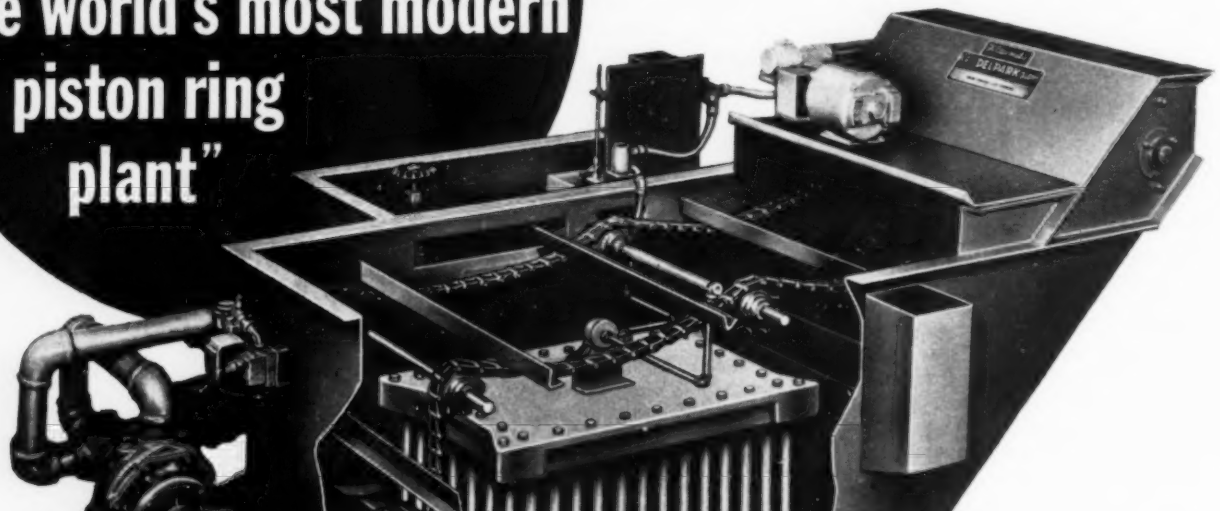
The Desmond-Stephan Mfg. Co.
Urbana, Ohio

Use postpaid card. Circle No. 263



CFC Delpark FILTER-MATIC Helps make Ramsey "The world's most modern piston ring plant"

CFC Delpark Filter-Matic clarifies mineral oil coolants, at capacity of 140 gpm, on 5 grinders in central system at Ramsey Corporation, St. Louis, Missouri.



Ramsey Corporation assures fine tolerance finishes on piston rings by clarifying grinding coolants continuously with the CFC Delpark Filter-Matic.

In keeping with their slogan of "the world's most modern piston ring plant," Ramsey installed the Filter-Matic primarily as a quality measure. They soon discovered a host of additional advantages — extended coolant life, less wheel dressing, longer wheel life, lower coolant temperatures, and subsequential man-hour savings due to decreased downtime. Ramsey now regards the Filter-Matic not merely as an accessory but as "essential equipment."

It will pay you to look into the CFC Delpark Filter-Matic — for automatic removal of sludge contaminants from coolants, cutting oils and other fluids. Write for technical literature to Dept. GF.

CFC

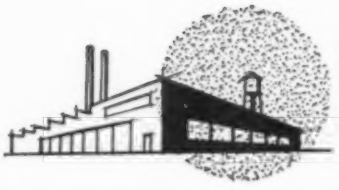
COMMERCIAL FILTERS CORPORATION

Fulflo Honan-Crane Delpark Michiana

MELROSE 76, MASSACHUSETTS

PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

Use postpaid card. Circle No. 264



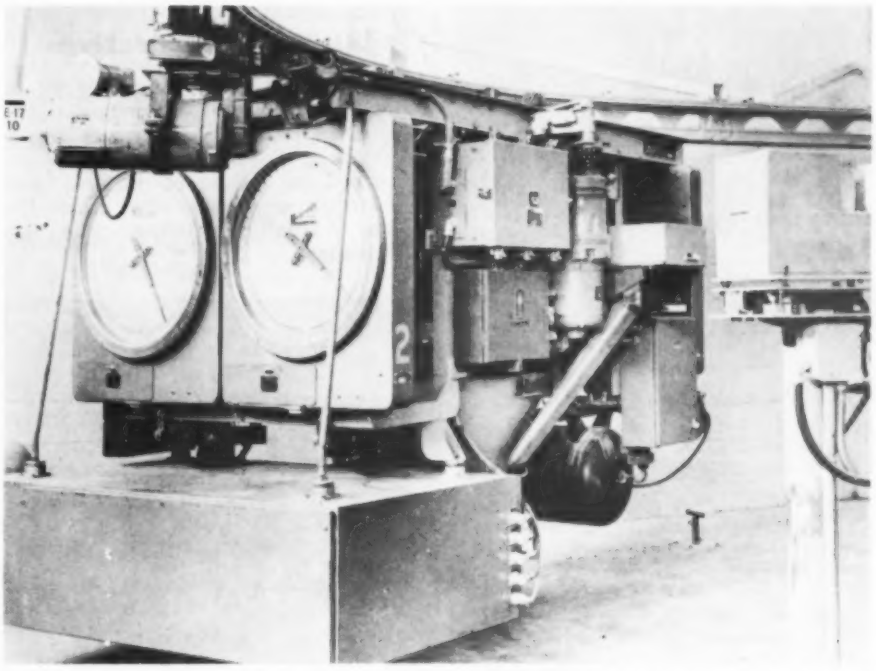
News from the Industry

Automatic Weighing Highlights Norton's New Organic Wheel Plant

Completely automatic weighing, actuated by specially printed standard IBM cards, is a high point in the design of Norton Company's new Plant 8, a $6½ million organic bonded grinding wheel molding operation.

Weighing is a critical part of the mixing operation, because the resulting ratio of bond to abrasive largely determines the grade or "hardness" of the wheel's grinding action.

The system now in use consists of three weighing carriages suspended by a monorail which travels under a row of tanks containing the various sizes and types of abrasive grain and bonding materials. The carriages travel in a loop in one direction only. To operate the system, the mixing foreman places a stack of punched cards in a pedestal mounted dispenser at the beginning of the cycle. As the carriage is brought into position, the dispenser issues one card to it representing one batch of mix. The card then takes over the control of the carriage which acts as a robot throughout the cycle, drawing the correct amounts from the proper tanks and finally discharging the hoppers at the correct mixing stations.



Robot weighing carriage approaches card dispenser (right) at beginning of cycle in new automatic batch weighing system, weighing organic wheel ingredients. Three carriages actuated by IBM circle the loop.

The starting point of the process is the punched card. This is a standard IBM card especially printed for this operation. Information punched into the card tells the control equipment on the carriage:

1. The abrasive grain tank from which to draw (this determines the type and size of abrasive).
2. The tank of bonding material from which to draw.
3. The weights required for both grain and bond.
4. The mixing station designated to receive the batch.

The card also contains any necessary instructions for the mixer operator who receives the batch.

The cycle starts at the card dispenser which holds enough cards to keep the three weighing carriages busy for the eight hour shift. The card is issued to the receiver on the carriage and off it goes at its top speed of 325' per minute down the monorail.

Proximity heads on the carriage superstructure count off the tank markers and slow the carriage in time to stop at the correct tank. Air and magnetic brakes stop the carriage in correct position with the overhead tank discharge gate. A mechanism on the carriage engages the gate and opens it, allowing the ingredients to fall into the hopper. As the correct weight is approached, the gate is throttled and the last few ounces are fed in slowly to insure accurate weight.

The brakes are of the normally closed type so any failure of the air system would cause the device to stop immediately. The air brakes are primarily to stop the large mass and the magnetic brakes are used in inching the carriage into the final correct position for drawing, discharging or picking up a new card. The air cylinder is replenished automatically each time a new card is received.

When the total weight of abrasive grain and bond has been drawn into the hopper, the carriage moves around the loop to the discharging area. An elevator lifts a section of monorail to the high level and the carriage travels along to the designated mixing station. A short section of monorail in the carriage tilts and the individual hopper rolls out of the carriage onto a spur track over the mixing station. Then the carriage advances a few feet to another spur rail where an empty

Measure...
Sort...
Control...

MICROtolerance Measurements

High Reliability
High Speed Sorting

Positive Continuous Machine Tool Control

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AIRBORNE INSTRUMENTS LABORATORY
DEER PARK, LONG ISLAND, NEW YORK
A DIVISION OF CUTLER-HAMMER, INC.

Use postpaid card. Circle No. 266

hopper is waiting for the next cycle. This also rolls by gravity into the carriage.

If an empty hopper is not ready at this station, the mixer operator pushes a reset button which advances the carriage to the next pickup station. If he fails to punch the reset button, a warning siren sounds.

The carriage continues to a second elevator which lowers it to the lower level whereupon the carriage continues around the loop to the starting point.

Announce New Publishing Corporation

R. C. Van Kampen, president of Hitchcock Publishing Co., Wheaton, Ill., and **O. A. Feldon,** president of Drake Publishing Co., Chicago, recently announced the merger of the two firms to form a new corporation under the name of Hitchcock Publishing Co., Inc. (Delaware).

R. C. Van Kampen

O. A. Feldon

In the new organization, Van Kampen will be chairman of the board; Feldon, president; and **Vincent C. Hogren,** executive vice president.

Hitchcock, founded in 1898, is a leading publisher of trade magazines. Drake Publishing, organized in 1948, has specialized in consumer sponsored magazines and business books. The statement indicated that both lines of activity would be continued and expanded.

Besides GRINDING and FINISHING, Hitchcock publications include MACHINE & TOOL BLUE BOOK, Hitchcock's WOODWORKING DIGEST, ASSEMBLY and FASTENER ENGINEERING, CARBIDE ENGINEERING, PLANT MAINTENANCE & ENGINEERING, MODERN PASSENGER TRANSPORTATION, SCHOOL BUS TRENDS, and three related directories.

According to Mr. Van Kampen, the merger is a logical step in the progress and future growth of Hitchcock Publishing Co. The acquisition of Drake will broaden the scope of Hitchcock activities and diversify its interests.

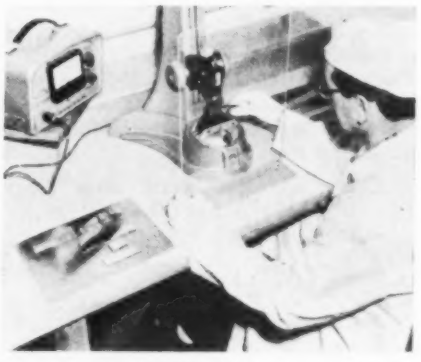
Two bears and a honey . . . Stanley and Lester Janus, midget entertainers who perform at trade shows as the animated trademarks of Behr-Manning Co., start a recent vacation in their native Czechoslovakia. Karin Sorensen, KLM hostess, adds a decorative touch to their send-off.

New Lab Provides Link Between Industry, Bureau of Standards

Metrolonics, Inc., the nation's first independent standardizing laboratory to provide traceable standards calibration to precision measuring instruments, recently commenced operations at 2201 N. Hollywood Way, Burbank, California.

The services Metrolonics, Inc. will supply to industry have been generated by the new demands for "Space Age" precision. Studies conducted by the Aero Space Industries Association and the Department of Defense have clearly defined the areas of traceable calibration for which primary contractors are responsible.

Metrolonics' function is to provide the necessary link between the National Bureau of Standards and the multitude of manufacturers who must use precision measuring instruments.



Metrolonics' technician places a gage block in position on a Cleveland Micro-Ac calibrated to read to one-millionth and one-half millionths of an inch. The specially insulated tweezers and plexiglas shield are used to protect inspected parts against heat interference and consequent distortion. Parts up to 24 inches in length can be measured with this instrument.

Around the Industry . . .

Second-Hand Grinding Wheels Termed False Economy

Re-use of grinding wheels from one grinding machine to another at different diameters, as well as using salvage or surplus wheels obtained from outside sources, seldom results in the intended savings and frequently causes unsafe grinding conditions, it has been pointed out by the Industrial Information Committee of the Grinding Wheel Institute.

Most production grinding wheels today are carefully designed and specified to be most efficient for their originally intended purpose. When moved from grinder to grinder and operation to operation this initial efficiency tends to be lost, resulting in inefficient performance, faulty and even spoiled work.

Surplus, salvage or scrap grinding wheels with uncertain prior history obtained from unknown sources are certainly no bargain when either safety or performance are considered. Injury to personnel, damage to equipment, down time and loss of production are but some of the hazards confronting users of re-used grinding wheels. Responsible plant operating management will have no part of them.

Conceivably, however, circumstance may arise where the use of grinding wheels for other than their original purpose may fall within the bounds of acceptable grinding practice. In all such cases, says the committee, the wheels should be returned to the manufacturer for speed testing and inspection.

Heald Gives Norton Co. A 75th Anniversary Sun Dial

A unique and accurate sun dial has been presented to Norton Company by The Heald Machine Company in honor of the former's 75th Anniversary. The companies have been across-the-street neighbors in Worcester, Mass., since 1903.

Mrs. Vernon E. Kilgour shows Norton's president, Milton P. Higgins (left) and Heald's president, Lawrence H. Cousineau, how to operate the sun dial designed by her father.

Designed by Major Victor E. Edwards, a native of the neighboring town of West Boylston, Mass., the dial is accurate to less than a minute at all times of the day or year. It can tell standard or daylight saving time directly, without reference to corrections in an equation of time.

Patterns and detailed notes were lent to The Heald Machine Company by Major Edwards' daughter, Mrs. Vernon E. Kilgour. Castings were made in Worcester, and all machine work and calibration was done by Heald craftsmen in their own plant.

Calibration had to be made for the exact location, 42°18'21" N. and 70°48' 14", I New Bond Street, Worcester. This is a grass plot directly between the administration buildings of the two companies.

Diamonite Expands Plant

Diamonite Products Mfg. Co., Shreve, Ohio, manufacturers of high density alumina ceramic grinding rod, have completed additional manufacturing facilities, with 12,500 sq. ft. of floor space. This is their third expansion in four years.

Promaco Expands at New Location

Production Machinery, Inc., marketers of Promacut cut-off saws and other metalworking equipment, has moved its general offices to 4941 West Belmont Avenue, Chicago 41, Illinois. The new facilities include a permanent demonstration showroom for large equipment and storage area for parts.

Baird Unveils New Marketing and Distribution Program

The adoption of a new marketing and distribution program which will completely reorganize its current dealer sales organization, has been announced by the Barrel Finishing Equipment Division, The Baird Machine Co., 1700 Stratford Avenue, Stratford, Conn.

The new plan calls for the appointment of a selected group of 21 major distributors to the metal finishing field in key marketing centers. These organizations will be designated as selected distributors and operate on a completely exclusive basis within their sales territories.

In addition, selected distributors will stock Baird barrel finishing equipment, perform test processing of samples, and have in their employ at least one thoroughly trained expert in tumbling operations. Selected distributors will also have the right to appoint sub or franchised distributors in their areas.

Grant Patent on Tool Grinder

The United States patent office has granted DeVlieg Machine Co., Royal Oak, Michigan, a patent on the new Micropoint tool grinder, according to an announcement by C. R. DeVlieg, president.

Anything new in Diamond Wheels?

YOU BET . . . THE NEW BC

RESINOID BOND FOR SURFACE GRINDING

Soft, "J and L," hardness wheels are recommended by many manufacturers for surface grinding.

Now a new, special "N" hardness bond has been successfully developed. Users report 30% longer life, greater efficiency, smoother finish, and elimination of chatter marks.

Man-made diamonds give optimum performance. Ask for and try the following grade:

MD 120 N100 BC

SEND US SATISFACTION GUARANTEED ORDERS. MAKE US PROVE THESE FACTS.

PRECISION DIAMOND TOOL CO.
P.S.M. ELGIN, ILLINOIS

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Changing Faces . . .

William G. Bancroft has been promoted to manager of the grinding wheel plant, Products Division, The Cincinnati Milling Machine Company. Previously, he was manager of manufacturing engineering.

W. G. Bancroft

Sevick Replaces Robinson at Allison-Campbell

Checking an abrasive cut-off wheel are (l to r) H. V. Allison, H. G. Robinson, and Richard D. Sevick.

Richard D. Sevick, director of research and development of abrasive cutting wheels for the Allison-Campbell Division of American Chain & Cable Company, Inc., has recently assumed the added responsibility of supervision of abrasive cutting machine development for this division according to an announcement by Hugh V. Allison, general manager of the division. Sevick replaces Harry G. Robinson, who retired in September after thirty-eight years as chief engineer of Campbell machine design.

R. J. Foresman, veteran coated-abrasives executive, has been named a vice president of Michigan Abrasive Company, Detroit, Michigan. He was formerly vice president, sales, of American Lincoln Corporation, Toledo, Ohio.

R. J. Foresman

J. Justin Basch has been elected second vice president, and **William A. Baltzell,** vice president, of Oakite Products, Inc., New York, N.Y.

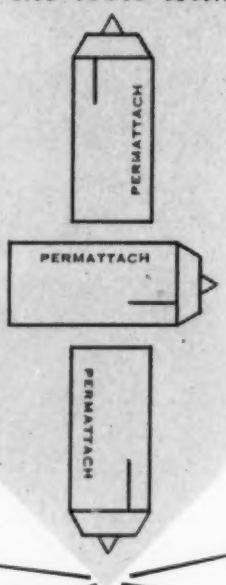
Timken Roller Bearing Company's board of directors, at a recent special meeting, elected **R. L. Frederick** as vice president, international divisions, and appointed **R. A. Gulling** as controller, in addition to his duties as assistant treasurer.

L. F. Bragg

The appointment of **Lloyd F. Bragg** as division sales manager for Van Norman Machine Co. in Alabama and parts of Florida, Mississippi, and Tennessee, including Nashville, has been announced.

PERMATTACH Diamond Tools

"the tools with the scribe lines"



No matter how you look at them Permattach tools tell you how they should be used.

Let us help you with your diamond applications and let our tools speak for themselves in your plant.

PERMATTACH
DIAMOND TOOL CORPORATION
Division of Hitchiner Manufacturing Co., Inc.
MILFORD 1, NEW HAMPSHIRE

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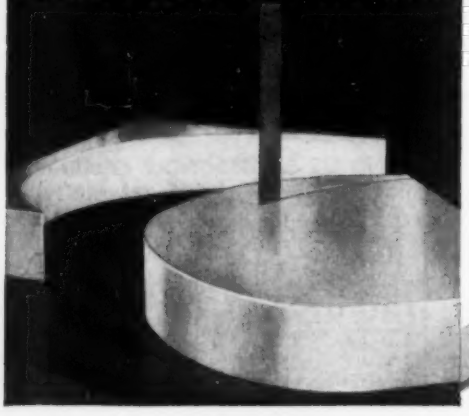
Diamond Coated Band Saw Blades



For cut-off of reinforced plastics, ceramics, carbides and glass. Ideal for wafering of large diameter Germanium and Silicon Solar Discs.

NOW AVAILABLE — diamond saws especially designed for cut-off and machining of reinforced plastics. Precision cut-off wheels for semi-conductor production — made in Thicknesses down to .004"

SAMPLE MARSHALL LABORATORIES, INC.
MANUFACTURERS OF QUALITY DIAMOND TOOLS
63 PARK AVENUE, LYNDHURST, N. J. WEbster 3-0570

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Norton Transfers Salesmen, Engineers

K. D. Swanson

J. M. Nelson

Ivan Johnson

J. R. Lowry

E. A. Danielson

W. C. Howard

New appointments in the Norton Company's grinding wheel sales force include the following: **K. Dale Swanson,** field engineer, Los Angeles county; **John M. Nelson,** field engineer, Chicago; **Ivan A. Johnson, Jr.,** abrasive grain engineer, Chicago-Indianapolis; **J. Robert Lowry,** field engineer, Atlanta; **Ercell R. Stevens,** abrasive grain engineer, West Coast; and **Robert D. Stubblebine,** Detroit.

In the Norton Company's sales force, **William C. Howard, Jr.,** abrasive engineer at Hartford, Conn., has been promoted to be supervisor of distributor sales promotion.

Edwin A. Danielson, abrasive engineer at Denver, Colorado, moves to Hartford to follow Howard, and **John W. Peterson** goes to Denver from Philadelphia, Pa., replacing Danielson.

Douglas M. Thornton, Norton Company abrasive engineer in Detroit, will be on temporary assignment in Sao Paulo, Brazil, for about six months.

Paul H. Carlson, formerly a Norton Company abrasive engineer in Chicago, has been reassigned to Los Angeles.

Samuel M. Hines, who joined Norton in 1957, has been made a field engineer in Philadelphia.

J. P. Kennedy

James P. Kennedy has been named general sales manager for Ace Abrasive Laboratories, Inc., of Mineola, N.Y.

New manager of The Black and Decker Manufacturing Company's plant at Towson, Maryland, is **John L. Turnbaugh,** replacing Karl B. Salanda, who has resigned.

Harry H. Bauer has been promoted to midwestern regional sales manager for the Scientific and Process Instruments Division of Beckman Instruments, Inc.

L. S. Sternal

Robert C. Jones, divisional sales manager in Seattle, Washington, for Behr-Manning Co. of Troy, New York, has been given added responsibilities as manager of industrial sales for the Portland, Oregon, division.

L. S. Sternal has been selected as sales manager for Timesaver Sanders, Minneapolis, Minnesota. He was most recently in a sales management position with the Coated Abrasives Division of Armour & Company.

R. A. Nyquist

Horace Frommelt, a specialist in metal removal, moves to Ferro Powdered Metals, Inc., Salem, Indiana, as director of manufacturing research.

Frederic B. Stevens, Inc., Detroit, announces the appointment of **Robert A. Nyquist** as a sales engineer, Metal Finishing Division, in the western portion of Michigan.

continued

"I just adore the strong, silent type!"

Because they feature exclusive *Velvet Joints* which permit a smooth, even flow of cutting surfaces, Jewel Brand Abrasive Belts eliminate needless "chatter" and jumping . . . last longer under continuous operation. Try some and see!

JEWEL BRAND

COATED ABRASIVES

Belts • Rolls • Sheets • Discs • Specialties

ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts

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HEAVY DUTY GRINDER SHARPENS METAL CUTTING SAWS TO 84" DIA.

For large Diameter Saws of all types, Inserted tooth, Segmental or solid tooth. Adjustable to wide variety of tooth spacings. Extremely heavy duty Construction Ball and Roller bearing throughout. Saw teeth generated by cam control. Adjustable by means of conveniently placed hand wheels to wide range of tooth spacings and depth of saw teeth. Saw is carried on heavy duty roller bearings for greater accuracy and fine finish.

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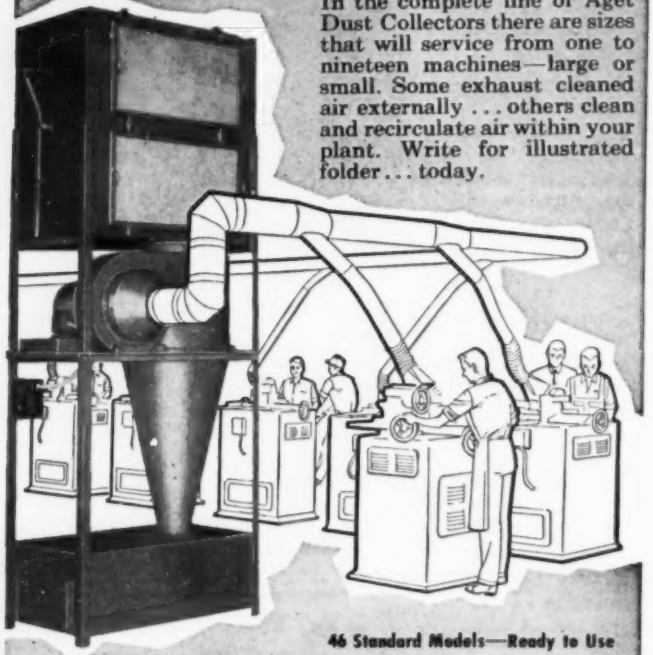
In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



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33 Box Street Brooklyn 22, N.Y.

Our reclaiming department salvages diamond powders from wheels, sludges, hones, saw blades, cotton wastes or any type of diamond bearing material. We will submit quotations on an analysis basis.

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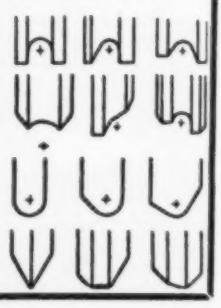

JEON MANUFACTURING CO.
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NEWS OF INDUSTRY *continued*

Arthur Kellermann has been promoted from plant superintendent to be manager of manufacturing of the Alemite and Instrument Division, Stewart-Warner Corporation, Chicago, Illinois.

Kellermann

Lapointe Machine Company, Hudson, Mass., has announced the appointment of **James W. Dopp** as vice president. He will continue to serve as sales manager.

J. W. Dopp

Richard Allchin has been named president of The Rotor Tool Company, Cleveland, Ohio, a subsidiary of The Cooper-Bessemer Corporation. **H. P. Bailey,** founder and former president of the company, becomes board chairman.

Other executive appointments in the company: **L. W. Dwors,** vice president, manufacturing; **Hugh L. Whitehouse,** director of engineering and secretary-treasurer; and **Paul Van Sittert,** director of research.

D. S. Linton, vice president and general manager of the firm, has retired.

Richard E. Krengel has been elected vice president and a member of the Board of Directors of Ex-Cell-O Corporation of Canada, Ltd., London, Ont.

R. E. Krengel

Fast, low-cost
AUTOMATIC Screen
SEPARATING Machines

Model SS-3S

- Save 1/3 or more in handling time.
- Eliminate hand operations.
- Speed tumble finishing and reduce cost per piece.

Rampe machines are noted for their simple, straight-forward operation; Model SS Screen Separators are particularly easy to use. Screen angle is variable 3° to 7°. Convenient handwheel permits speed adjustment from 145 to 350 reciprocations per minute. Square screens are easily removable and interchangeable in selected mesh sizes. Simple manual start-stop buttons. Five models are available: in-line or compact (illustrated) types. Eliminate costly hand operations:

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J. R. Strom

John H. Nelson

John R. Strom, chemist and process engineer for the Roto-Finish Company, Kalamazoo, Michigan, has been named to the newly-created post of technical director of the Ransohoff Company, Hamilton, Ohio. Both companies are under the same management.

John H. Nelson has been moved up to sales manager of Williamsville Buff Company, Utica, New York.

Ernest W. Bonness, formerly works manager, Industries Group, retired at the end of September after nearly fifty years of service with Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin.

Fred T. L. Grimm, formerly purchasing agent of the Detroit plants of Ex-Cell-O Corporation, has been moved up to director of purchases, succeeding Fred Sicklesteel, who retired early in September.

"Good heavens, Ambrose . . . you mean we're completely out of them?"

Disturbing as it seems, people occasionally run out of Jewel Brand Abrasive Belts. Fortunately, they can replenish their supply quickly and easily through their nearby Industrial Distributor. Check *your* stock now!

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Converts an accurate vertical milling machine for electric jig grinding and carbide jig milling.

Precise Jig Grinders are custom built vertical milling machine conversion units — for grinding or rapid carbide micromilling of holes to tolerances of .000,1" and closer — at speeds and feeds never before possible with low torque, wasteful, air turbines! Surface finishes well within 10 micro inches. Models with manual and automatic feed as well as special models to convert jig grinders with air spindles to electric quills. Infinitely variable speed — 15,000 rpm to 45,000 rpm. ½ hp output; max. hole size 3¾".

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1/3	3.50
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1	10.00
1-1/2	14.80
2	18.50
2-1/2	23.00
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Reject Thread Grinder Diamonds For Many Different Uses In Any Shop. ¼ x 1—¼ x 1½—⅜ x 1⅝ $2.00 Per Tool. 6 Tool Min. Order.

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Diamond clusters any holder—any design 1 ct. $10.00 per tool.
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NEWS OF INDUSTRY *continued*

AA Gage Company Expands Industrial Representation

Four new representatives in the United States have been appointed by AA Gage Company, Detroit, Mich.

The representatives are The Eaton Company, with offices in Hackensack, N. J. and Philadelphia, Pa.; Wetzel Tool Corp., with offices in E. Hartford, Conn. and Lynn, Mass.; W. K. Nelson Company in Minneapolis; and T. E. Sweet in Salt Lake City, Utah.

NATIONALLY KNOWN DIAMOND WHEEL manufacturer wishes to expand their SALES REPRESENTATION. Choice territories now open in EASTERN — CENTRAL — NORTHWESTERN STATES.

Box 34
Grinding & Finishing
Wheaton, Illinois

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Thompson "TRUFORM" Crush Surface Grinder 12" x 36" capacity, Model T8B Beautiful condition—new in 1951, Serial 514255.

MOON MACHINERY CO.
913 So. 19th St. Newark 8, N. J.
ES 3-9733

Optical Gaging Opens West Coast Facility

Optical Gaging Products, Inc., a subsidiary of the Ex-Cell-O Corporation has opened a West Coast branch to manufacture chart-gages and to offer engineering services in the field of optical gaging. The new quarters will be located in the Ex-Cell-O Corporation plant at 12200 S. Bellflower Boulevard, Downey, California.

LA Machine Tool Builders Merge

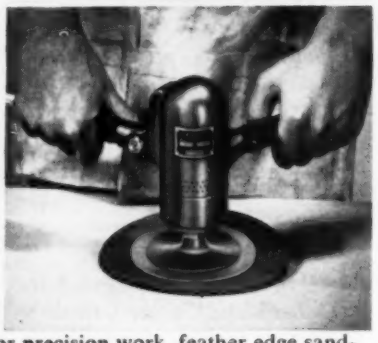
Two Los Angeles firms, Precision Processing Co., manufacturer of AK and PreCor machine tool attachments, and King Machine and Manufacturing Co., builders of Berkroy sheet metal tools, have merged, combining personnel and manufacturing facilities of both companies. The new organization will retain the King name, with manufacturing facilities and offices located at 1171 East 32nd Street, Los Angeles 11.

Houghton Wins R & D Contract

The United States Air Force has awarded a new research and development contract to E. F. Houghton & Co., Philadelphia, Pa. for development work leading to new fire-resistant lubricants and fluids to be used in high speed aero-space vehicles where temperatures are too high for conventional fluids.

AIRETOOL GRINDERS AND SANDERS...

for high speed rough and finish grinding



Grind better and faster with job-proven pneumatic grinders by Airetool. For heavy duty work, nothing beats the new Airetool 700-V vertical grinder with revolving guard. Well balanced and easy to handle, it takes a 6" wheel or brush. And, for precision work, feather edge sanding and fine metal finishing, there's Airetool's Model 500-V lightweight vertical sander with flexible pad. Takes up to 7-inch discs with three distinct models operating at 2300, 3000 and 4000 rpm. For information on Airetool's complete line, write for Bulletin 67.

AIRETOOL manufacturing company
SPRINGFIELD, OHIO

30 years' experience in pneumatic tools

BRANCH OFFICES: New York, Chicago, Tulsa, Philadelphia, Houston, Baton Rouge. **REPRESENTATIVES** in principal cities of U.S.A., Canada, Mexico, South America, England, Europe, Puerto Rico, Italy, Japan, Hawaii. **EUROPEAN PLANT:** Vlaardingen, The Netherlands. **CANADIAN PLANT:** Brantford, Ontario

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Hoofnagle Bros. To Name Agents for Wilson Tools

Hoofnagle Brothers, 18264 James Couzens Highway, Detroit, and 202 Monroe Street, Concord, Michigan, have been named sales agents by Thomas C. Wilson, Inc., Long Island City, New York, to appoint distributors for its Wilson Pneumatic Tool Division.

Sutton Tool Company, Sturgis, Michigan, has appointed H. G. & Associates Manufacturers Representatives, 26151 Euclid Avenue, Cleveland 32, Ohio, as exclusive distributor in northeast Ohio for the standard line of Sutton collets, feeders, and special work holding devices.

The Edward Blake Co., 570 Pleasant St., Watertown, Mass., announces the appointment of the **Bud Watts Machinery Co.** of Memphis and Chattanooga, Tennessee, as their sales representative in Tennessee and the surrounding area for Blake tap, flute, and chamfer grinders, and for Black Diamond and Worcester drill grinders.

Clyde Lanham, 4029 Fairmont Way North, Birmingham, Alabama, has been selected by Nu-Matic Grinders, Inc., of Cleveland, Ohio, as their exclusive representative in the states of Florida, Alabama, Georgia, Mississippi, and Tennessee, as well as in Baton Rouge and New Orleans.

Wagner and Madison Company, 18450 Livernois Avenue, Detroit, Michigan, have been appointed sales agents for The Van Keuren Company, Watertown, Massachusetts, manufacturers of precision measuring tools.

Slocomb Names Distributors

Niles J. Brook, vice president of the J. T. Slocomb Company, South Glastonbury, Conn., has announced the appointment of Mill Supplies, Inc., 230 South Street, New Britain, Conn. and Merit Machinery, Inc., 2311 Babcock Blvd., Pittsburgh 37, Pennsylvania, as distributors.

Speed-D-Burr Changes Hands

Forrest F. Hinkley has purchased the Speed-D-Burr Corporation (precision barrel-finishing equipment) 3613 San Fernando Road, Glendale, California, where he will serve as president and general manager. He recently resigned as vice president of Areoquip's Western Division.

Diamonite Appoints National Sales, Cincinnati

R. C. Mulligan, sales manager of Diamonite Products Mfg. Company, Shreve, Ohio, announces the appointment of National Sales Corporation, Cincinnati, Ohio, as exclusive representative for Diamonite grinding rod in southern Ohio and Indiana and the state of Kentucky.

Williamsville Buff to Utica

Williamsville Buff Company, Inc., has started operations on the premises of Divine Brothers Company in Utica, New York, moving from Danielson, Conn.

"Egads, sir . . . there's been nothing like 'em since the Flora Dora girls!"

Few performances can match the superlative grinding, smoothing, and polishing action of Jewel Brand Abrasive Belts. A trial run proves it! Order through your Industrial Distributor today.

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DIAMOND PINS . . .

25 Sizes in 0.010 increments, from as small as 0.020 to 0.500" offer a low cost solution to precision **jig** and **internal grinding** of small holes. Diamond grains are permanently surface bonded to a hardened tool steel shaft by an exclusive Chrome-Lok process for maximum strength, precision and tool life. **Two grit** sizes—80/100 for faster metal removal; 200/240 for finishing—all with cylindrical heads.

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BETTER TOOLS FOR BETTER WORK

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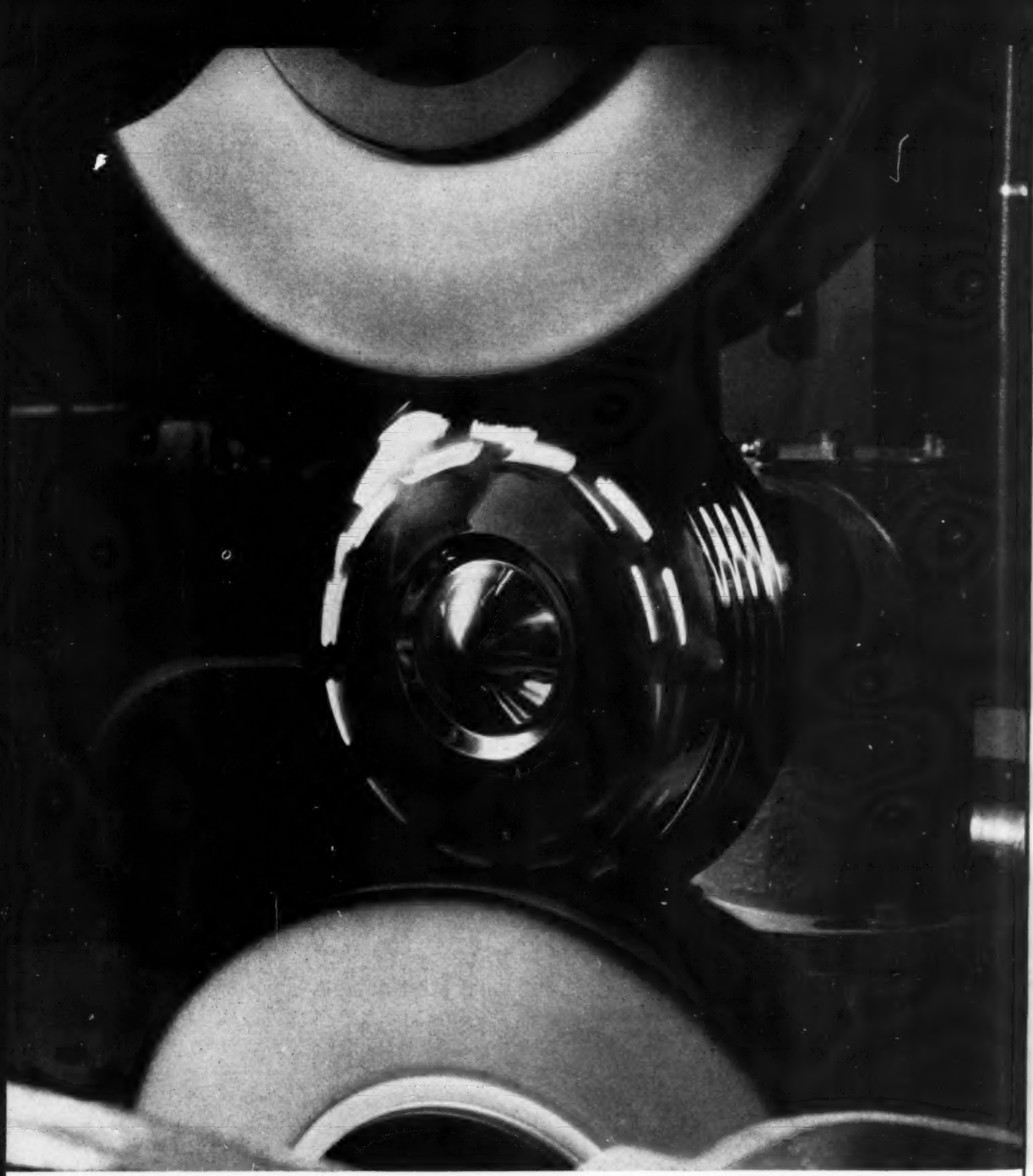

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Buffing automobile hubcaps with this versatile, compact Acme two-headed buffing lathe saves time, saves space and cuts production costs. Faster than ever before, and in one automatic high-speed operation this multiple station unit removes "orange peel," pits and other surface blemishes from the curved surfaces of the part. It gives the hubcap an extra smooth, flawless, high-luster finish, ready for plating. ■ This is the kind of efficiency that cost-conscious companies, both large and small, expect . . . *and get* . . . from versatile Acme finishing machines. Basic machine designs achieved over fifty year give Acme customers an advantage of selecting one of many equipmen arrangements, even for the most specialized finishing application ■ Automotive trim, building hardware, electrical and plumbing fi tures, household appliance and kitchenware, primary metal sheets an coils . . . these are some of the many mass-produced parts and produc now served efficiently by Acme machines. If you have a finishing prob lem call or write for comprehensive catalog today.

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GRINDING and FINISHING

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Definition and importance of hardness and toughness of grain can be beneficial to the abrasive user.

40 **What Functions Do Grinding Fluids Perform?**
Understanding of basic theories and applications of types of coolants promotes more efficient grinding.

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Automatic dressing maintains accuracy and increases efficiency on internal grinding.

45 **Finishing—$.06 per Crankshaft**
Cost of coated abrasives is reduced to 6 cents per shaft for refinishing operation.

48 **A Breakthrough for Stainless Producers**
Major development on wide-belt finishing of stainless steel strip greatly reduces costs and provides machine quality never before possible.

57 **How U.S. Steel Selects Wheels for Maximum Efficiency**
Standard forms and test requirements provide maximum efficiency.

58 **Automatic Flap-Wheel Sheet Edging Saves Maintenance**
Flap-wheels for cleaning edges of sheet steel eliminate dressing.

59 **More Accurate Sizing Improves Corundum Quality**
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Complete report of how the world's largest fishing reel company takes advantage of a well-organized barrel finishing department.

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A Final Thought

THE COOKIE TEAM OF EDUCATED CONFORMISTS

One discouraging aspect of our age is its deification of conformity. The goal of educators is to foist upon the world graduates who are "well adjusted" and able to "live in harmony with an interdependent society." They are produced with grim regularity like so many cookies pressed out with a cookie cutter.

Many corporations, tripping gaily hand in hand with educators, fill managerial slots with men who can become members of a "team", thus guaranteeing that they will produce nothing of consequence. No "well adjusted" team of nattily-dressed cookies will answer the questions of our age, nor advance mankind one step, nor do anything but crumble away quietly and unobtrusively, leaving behind only more unanswered questions. The conformist does not advance; he stands still and throws rocks into the path of progress. He squats on the status quo like a stone seal on its base at the entrance of the zoo.

The aim of educators is to make certain that nothing with square corners leaves their cloistered halls; the air of many corporations is to hire people who will maintain the status quo. Let us have no jagged corners among our round cookies; let no one set off a firecracker in the paneled board room or stick a pin into the smugness of the schoolmaster.

One may deduce that I am not in sympathy with conformity or conformists. I believe with Konstantin that "the conformists' world is a graveyard in which one grave is like another and everyone quite dead." We have no place for such in our society. This is the age in which a cold war rages with the communists, in which nations writhe under the dictator's fist, in which flares an economic battle with foreign nations. It is the age of the irresponsible labor leader, the narrow, profit-minded businessman and the mediocre bureaucrat. This steaming mess is tended on the stove and assiduously stirred by "men of the team" who believe, like Leibnitz, that "this is the best of all possible worlds."

On the other hand, I do not believe in that crowd of self-styled nonconformists, unwashed, unshaved and hatless, who swagger about in turtle-neck sweaters and gibber. These frustrated little escapists need detain us no more than a curious flea circus. A true nonconformist is, among other things, dissatisfied, intelligent and creative. All creative thinkers are intellectual nonconformists and when they publish the results of their thoughts one will read such titles as, "The Theory of Relativity," or "A Declaration of Independence." Possibly their claim to fame does not lie in the written word. Instead, one may chug up the Hudson in a steamboat, talk through a wire, study by a strangely glowing bulb, or fly through the air like a bird.

We live in the shadow of the scientists, philosophers, artists, political and religious thinkers, all of them nonconformists who were dissatisfied with their world and changed it. In the entire bunch there lurked not one staunch "team man". History is a tabulation of nonconformists, rebels, individualists and, yes, even scoundrels. Would we not be well advised to determine how we may create an environment conducive to the development of men of thought and action? Should we not encourage nonconformist thinking? Are we not silly, in this critical age, hard pressed by a ring of evil situations, to place our faith in a cookie team whose only qualification is that they were cut out by the same cutter, and who stalk importantly about in the graveyard, the dead among the dead?

One might well wonder and ask: Are we our own greatest enemies?

Wm. F. Schleicher

Vice President & Editorial Director

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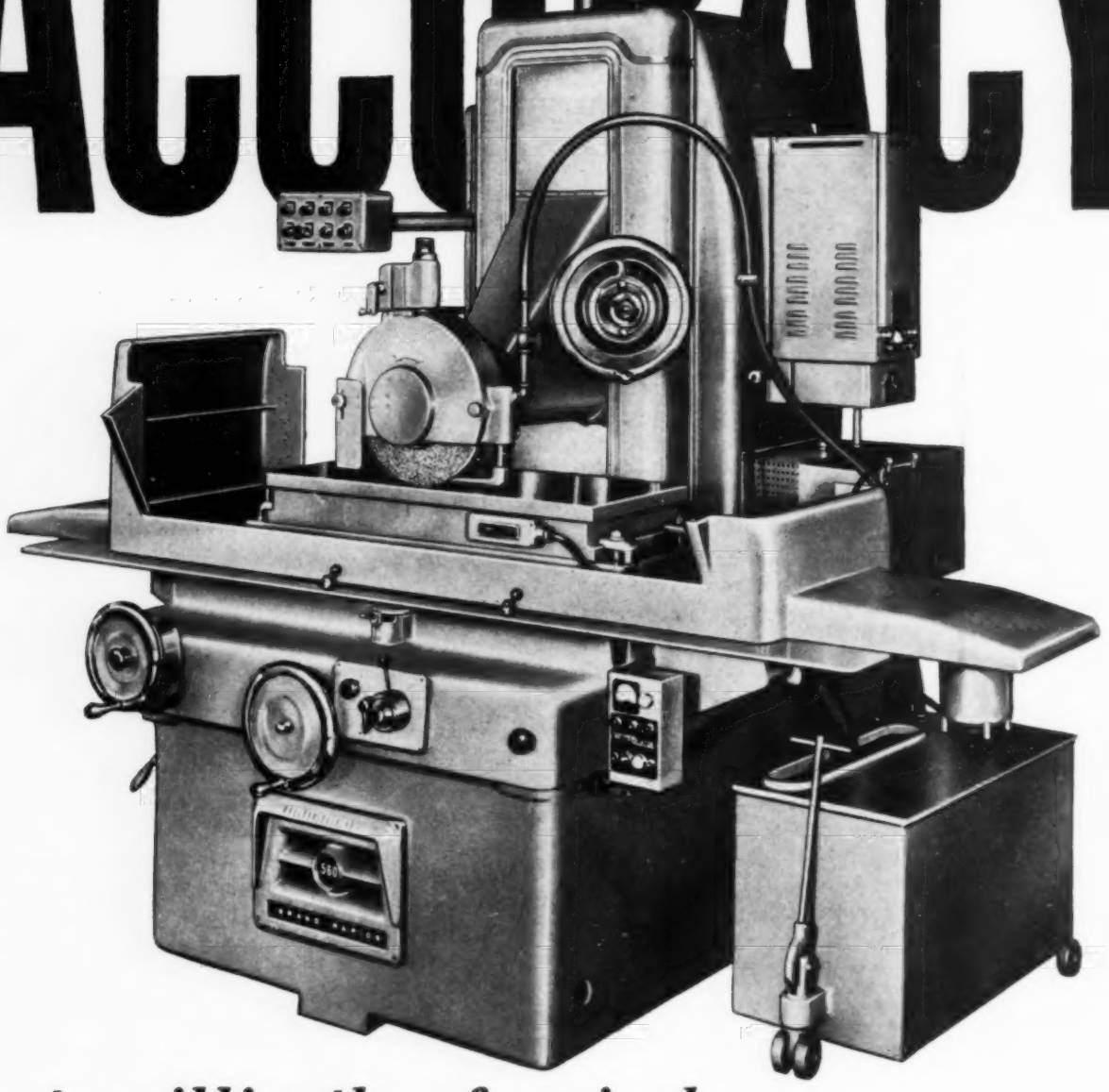

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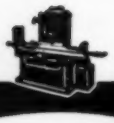

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